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IMPROVED SELF-ACTING FIRE TANK.

The alarming frequency of fires within the last few months has awakened an unusual interest and provoked a deal of newspaper discussion as to the best means for the prevention and extinguishment of conflagrations. The lesson of the Boston fire is one that has often been pointed out, but seldom heeded, namely, that when a fire has reached a certain stage, it gets beyond the control of any apparatus whatever, and takes, for the most part, its own course. Any improvement in our present systems should be in the direction of a greater promptitude in extinguishing incipient fires before they reach the dangerous stage.

The point aimed at in the construction of apparatus heretofore has been the projection of the largest possible bulk of water upon the fire. The result has been an enormous increase in the item of water damage, without a proportionate gain in the celerity of action which is the real element of success at fires.

Considerable attention has been given, within the last few years, to the perfecting of devices which should take advantage of the extinguishing properties of carbonic acid gas. This material seemed to promise the condensed power requisite to portability in the transportation, with the utmost expedition in generating pressure and manipulation, while possessing the additional recommendation of quenching fire without water damage. Coupled with these advantages, there seemed to be a certainty of action and a marvelous power over flame, unattainable by any other known method.

The only system in which this principle has been made practical is that in which chemical action is used, not only to impregnate the stream with the desired extinguishing quality, but also to propel it, and in which water is used to dissolve the chemicals, to hold the gas in mechanical combination, and to give momentum to the projected stream.

The small machines called "extinguishers," which combine the points enumerated, have made a splendid record, and in scores of instances have put out fires that were apparently out of all proportion to the means used. The limit of the extinguisher is in its capacity. As the operator must carry on his back the engine, hose and material, the weight is restricted to 85 lbs., and the stream to a diameter of one eighth of an inch and a duration of perhaps five minutes. The principle was perfect, but its full development seemed to call for a continuous stream of such volume as would control a fire in the more advanced stages. The first practical success in this direction is found in the street engine of the Babcock Fire Extinguisher Company. The engine is constructed with two copper tanks of a capacity of 120 gallons, tested to a pressure of 500 lbs., and mounted on wheels. The hose is connected and ready for instant action, and the stream, of thirty times the volume of that of the "portable," is thrown 100 feet from the nozzle. On arriving at a fire, a pressure of 200 lbs. is raised in ten seconds, and so ready is the manipulation that the stream is on the fire in less than a minute. This celerity of action is due not merely to the instantaneous generation of pressure, but to the fact that no suction hose has to be connected, and no leading hose laid, preparatory to playing. The result of this promptitude, together with the marvelous extinguishing power of the stream, is, in a large proportion of instances, the putting out of the fire before it is fairly started. Statistics prove that fires are, eight times in ten; discovered in the earliest stage, and the fate of the building is usually decided by the action of the first five minutes.

Thus far the engine has been introduced into the departments of some fifty cities and towns, and has already made a history such as no other apparatus has ever approached. At Chicago the engine puts out fifty per cent of the fires within its range, without the aid of the steamers. The mayor, in a late communication to the fire commissioners, recommends the purchase of fourteen more of these engines for the department, at a cost of $2,000 each. At Boston the single engine that was ordered since the fire there has been in the department two weeks, during which time it has put out four fires in advance of the steamers, and has made so favorable an impression that the chief engineer recommends the purchase of four more. At Holyoke, Mass., the engine extinguished 13 fires, out of the 19 that have occurred in the last two years, before the steamers could get a stream on. At many of these fires, the engine has shown an efficiency little short of the miraculous.

Every town that is supplied with these engines has reduced its fire and water losses materially, generally to less than fifty per cent of the average before its adoption. At Holyoke the loss at three fires, in the five months previous to its introduction, was $375,000. During the remainder of the same year (seven months), the loss in six fires was $1,665. In nearly every instance the first building is saved, and often almost without damage. A still more astonishing claim is that, out of 300 fires heard from, in only three cases has a second (detached) building burned. At Westfield, Mass., the engine handled four fires at once, and saved all the buildings. It has been used under every variety of circumstance, and has never failed to throw its stream.

The wonderful success of the forms mentioned has led the company to the development of the same general principle in a form particularly adapted to the protection of the interior of large buildings, factories, theaters, sailing vessels, etc. By reference to the accompanying illustration, the construction of the apparatus will be readily understood.

A is one of a pair of tanks holding from 50 to 100 gallons each, and filled with soda solution to the level of the gage cock, C, through the opening, B. D is the acid chamber which is filled through the opening, E, and discharged by the valve, F. On discharging the acid the pressure is shown by the pressure gage, and on opening the gate, K, the stream flows up through the exhaust pipe, G, into the main, H, finding vent through the hose on every floor where a cock is opened. The agitator, I, is for stirring the fluid to facilitate the dissolving of the soda in re-charging. The practical working is admirably illustrated by the picture in the background, and will be comprehended at once. The plan is virtually the same as was lately presented before the Polytechnic Association, by Mr. D. J. Tapley, where it attracted much attention.

The peculiar advantage of this form is that it gives an instantaneous stream of a sufficient volume to control any fire that can be built in an ordinary interior. In theaters and churches it will throw a stream to the highest part of the ceiling, and even from the roof a stream can be used to protect from fires in adjoining buildings. The power of the tanks is sufficient to force a stream through 800 feet of per

Fig 1

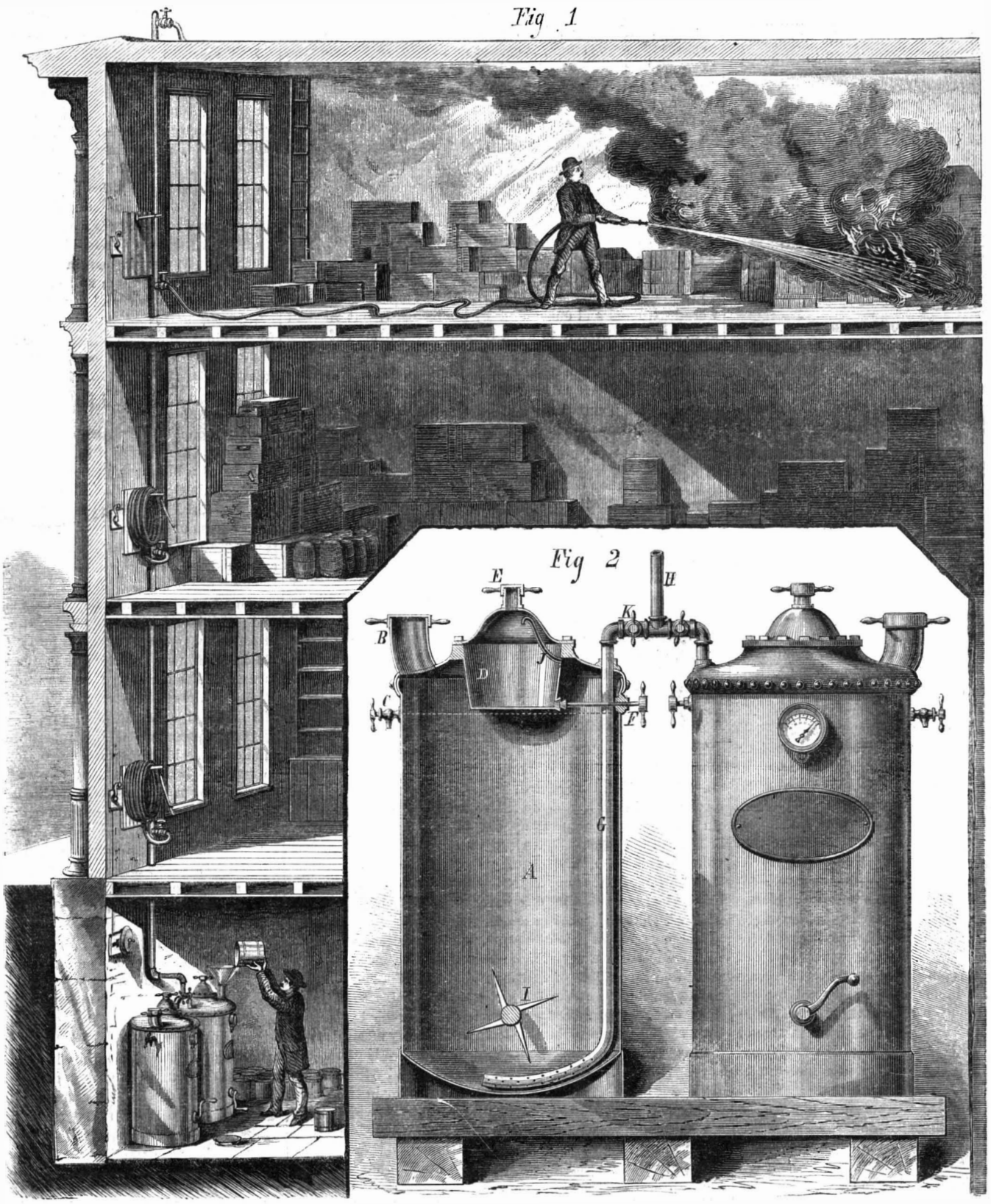

Fig 2

THE BABCOCK SELF-ACTING FIRE TANK.

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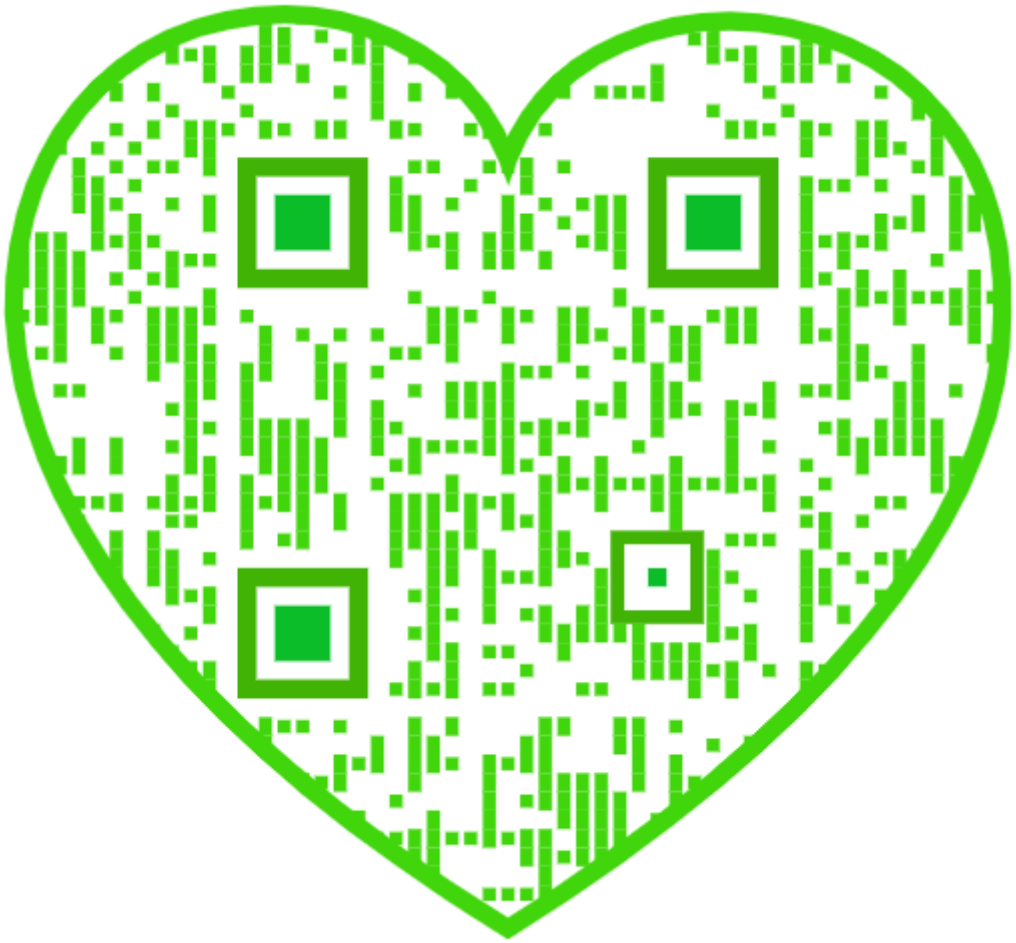

pendicular pipe, or any length of horizontal hose or pipe. The stream seems to possess the wonderful property of clearing a room of smoke almost instantly, though filled to suffocation. The gas also seems to interpose a wall of non conducting vapor between the hoseman and the fire, which protects him from the heat. In fact, experience is developing every day new advantages for this system.

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Contents.

(Illustrated articles are marked with an asterisk.)

Academy of natural sciences, Philadelphia... 149
Accident, a singular railway... 146
Answers to correspondents... 154
Architecture in Paris, street... 146
Astronomical notes... 148
Blacking brush, box, and holder*.. 148
Boiler explosions, the recent... 148
Boiler inspection, local... 147
Boilers, collapse from low water in 145
Bottle stopper, a new*... 147
Brakes, power railway... 144
Brooklyn to New York, the annexation of... 145
Business and personal... 154
Camphor wood... 146
Clean greasy vessels, how to... 151
Clock, registering tell tale*... 146
Drying varnish... 150
Explosions produced by high tones 144
Fire tank, self-acting*... 148
Grindstones not extinct... 152
Heater and filter*... 147
Honor to whom honor is due... 144
Hoosac tunnel mineral water... 146
Iron workers, a good year for... 151
Key, novel form of*... 147
Measuring fibers, nstrument for* 150
Metric commission, the... 145
Notes and queries... 154
Parliament house in Berlin, the new*... 151
Patent decisions, recent... 152
Patented in England by Americans, inventions... 152
Patents, official list of... 155
Patents, recent American and foreign... 152
Rail question, the creeping... 146
Rats, incendiary... 151
Richmond, Va., the resources of.. 149
Safety valve, improved*... 146
Saws, attaching handles to*... 150
SCIENTIFIC AMERICAN, what our friends think of the... 147
Scientific and practical information... 149
Sewing machine monopoly, the... 145
Ship, new German war... 146
Signal lantern, self-lighting... 147
Steam pipes, ignition by... 148
Stone saw, diamond*... 150
Sulphite of lime in cider... 148
Traction engine, a novel... 144
Variety manufactory, a... 147
Water meters in cities... 145

HONOR TO WHOM HONOR IS DUE.

There is a large figure on a house in Center Street, New York city, which at most hours of the day may be seen vigorously engaged in turning a crank. Pedestrians on the street jostle each other while vainly trying to make out what the wooden man is about, and passengers in the cars stretch their necks to obtain a clearer view. The residents of that locality seem to take it as a matter of course and attend to their affairs as if nothing uncommon was going on; but the mystery still remains unsolved. We have caused an investigation to be made and have learned that, instead of the man turning the crank, it is the crank that turns the man. And upon this fact we wish to found a few practical observations. The sturdy figure, making itself very conspicuous before the world and attracting all the notice it can, may stand for the lucky appropriator of other men's discoveries. It very frequently happens that the man who discovered the principle upon which an invention is founded, and which is, in fact, the engine that moves the whole apparatus, is forgotten; but the noisy speculator who runs about the streets and gets up stock companies and makes a fortune, and, in the minds of many persons, is entitled to all the glory, is really little more than the lay figure moved, by an invisible crank, by a power discovered after years of toil and study by some unknown and forgotten personage. The man who reaps the fame and money is turned by the crank which, in his conceit, he fancies he moves himself. Giving honor to whom honor is due is a very rare occurrence. Mankind looks at results and cares very little for the secret springs that have proved the fountain head of success. There is nothing so successful as success; and under the glow of triumph and the applause of men, the money maker accepts the public testimonials, goes to all the grand dinners, has his portrait painted for some public institution, and finally claims the whole credit of a grand enterprise. There is no doubt that the men who furnish the capital and push inventions to practical use are entitled to a fair share of credit for what they have done; but they cannot be accused of unselfishness in the matter or of acting upon purely patriotic motives. "Rich fields and pastures new" are all that this class of persons demand; and if the dividends are all right, they ought to keep quiet. What shall we say for the silent worker who discovers a great principle from which springs a grand progeny of inventions? The misfortune is that we frequently lose sight of such a benefactor. Just as the sources of the Nile are hardly yet known to the world, while in the plains it becomes a grand river and flows through numerous mouths into the sea, so with the fountain head of discoveries: we often fail to trace the precise source, but in the results we have a mighty river of applications, known to the whole world. The rill which has its rise among the snows and rocks of the mountains finally flows quietly past smiling meadows and the haunts of men; and while it sings its pastoral, we forget the ice and snow and beetling crags whence it had its origin.

Professor Tyndall in his eloquent plea for original research has in mind the devoted band of workers who, in poverty and reproach, in the chill atmosphere of neglect, often amidst persecutions and opposition, have made the discoveries which are the pride and boast of our present civilization. He cautioned us to protect and foster all such persons, and he proved the sincerity of his motives and the strength of his interest by leaving in the hands of trustees all the net earnings of his laborious lecturing tour in the United States, for the support of needy students who wish to devote themselves to pure science.

Any one who is willing to accept a career of this kind must be imbued with the true missionary spirit and not be actuated by anticipations of reward or desire for fame. Sooner or later, true honor may be accorded to the person to whom it is due; but this is rather the exception than the rule, and he who keeps public opinion before him as the spring for action will ask for bread and receive a stone. It is rare indeed that any great discovery has been made when sought with a view to immediate practical results. Nearly all of the grand principles upon which are based the leading applications of the age were discovered and worked out by men who never thought for a moment of the possibility of applying them. It would almost appear to be with original discovery as with humility: the moment it looks upon itself, it is gone. Let us glance at a few of the leading discoveries of modern times, and see if this statement be not true.

The doctrine of the correlation of forces—that force is not lost any more than matter—which in its importance is not inferior to the discovery of the law of gravitation, was first enunciated in a modest paper by Dr. Mayer, a practising physician in a small city in Germany. He could not possibly have foreseen the results that are likely to grow out of this law. Newton's analysis of solar light, Volta's battery and Oersted's electro-magnetism are further illustrations of discoveries which have grown out of a search for truth and not for fame. Although scientific writers have given due credit to these illustrious men, it cannot be denied that those who have made the applications have run away with popular favor and have gained all the prosperity. The great engines, propelled by the forces which were made known to us by Newton, Volta, Oersted and many others, keep in motion the crank that turns the busybodies of the world, and gives them a name for enterprise which they scarcely deserve. It would aid very much if the real benefactors could have due credit in their lifetime. There is little else that they desire, and sympathy and praise costs nothing, while it is often rich in the fruit that it may help to bring to maturity.

Professor Tyndall has set us a noble example of unselfish liberality. He had every right to carry with him to his home all the money that had been cheerfully given by those who were instructed and enchanted by his lectures; but instead of doing, so he prefers to hand it back for the benefit of those who gave it, and in aid of the common cause of scientific learning in which the whole world takes an interest. This is an example worthy of imitation. The trustees who have charge of the Tyndall fund will no doubt be glad to have the amount increased as largely as our wealthy citizens may desire. They cannot have too much money for the promotion of original research, and it is equally certain that no investigation founded upon correct scientific reasoning can be made in vain. Let us start as many rills of discovery as we can, knowing full well that they will swell to torrents and ultimately flow gently through the valleys until they empty into the common ocean of human wants. And we must not forget that every grand result had its origin in some apparently insignificant fact, which, by accretions and accumulations, becomes important and finally culminates in a successful application. Keep the fountains of discovery pure and bright, give honor to those who deserve it, and the streams of knowledge will not dry up and the world will not want for inventions.

A NOVEL TRACTION ENGINE FOR RAPID TRANSIT.

The interest, with which all plans leading to the accomplishment of a suitable system of rapid transit in this and other large cities is regarded, has been the means of calling forth many inventions designed to meet the existing need. An engraving of a novel apparatus of this class was published in the SCIENTIFIC AMERICAN on page 118 of our last volume, under the heading of "Lamm's Fireless Locomotive." One of these novel locomotives has lately been put in practical operation in our neighboring city of Brooklyn, with very flattering and interesting results.

The machine consists of a strongly made cylindrical reservoir, enclosed in a very thick clothing of felt and other material to prevent loss of heat by radiation. Connected with the reservoir is a steam engine which actuates the axle of the driving wheels. Before starting the reservoir is charged with very highly heated water from a stationary steam boiler, the heat being such that a high steam pressure is generated in the reservoir. As this pressure is relieved by the exit of the steam into the engine, a portion of the water in the reservoir is converted into steam by the heat with which it is surcharged. This conversion, continues until the temperature of the water falls to 212°, and the machine can therefore be operated during the interval until nearly that point is reached.

The experiments, which we witnessed, consisted in charging the reservoir of the machine with hot water having a temperature of 360°, which yielded a steam pressure of 145 pounds per square inch, and then running the locomotive for a distance of six miles, on the track of the Coney Island Railway. During the first half of the journey, which was accomplished in 15 minutes, the pressure fell to 90 pounds; and at the expiration of the trip, which occupied 33 minutes, the gage showed but 65 pounds, the rate of diminution being much more rapid under high pressure than when the same had become lowered. The speed attained was twelve miles per hour, the burden being a single six ton car for 35 passengers; we were assured, however, that the same time had been made with two carriages containing seventy persons. In actual use it is proposed to locate, at the termini or other points of the line, a sufficient number of stationary boilers from which the locomotive may be charged or its power renewed when exhausted.

From the results of the trials and those that have been deduced from the successful operation of the device in New Orleans and elsewhere, we are inclined to think the invention one of considerable utility. It is perfectly safe, because the steam pressure can never increase but is always steadily lowering. Being without a fire, it is free from many of the defects of the dummy. Of course there is no smoke, while the noise of the exhaust is scarcely perceptible. Its speed and tractile power are, as practically proved, sufficient for ordinary purposes; the cost of construction is not great, and as regards economy, its use can probably be made less costly than that of horses. We noted especially that the motion was regular and easily governed or stopped by the engineer, and that the radiation of heat, which, it might be imagined, would rapidly take place from the reservoir in cold weather, was almost completely prevented by the thick surrounding casings. We are of opinion that the invention is worthy of thorough investigation from parties interested in street railroads. We should think it well adapted for the elevated railroad on Greenwich Street, New York, and for transferring freight from the steam terminus of the Hudson River and New York and New Haven railroads at 42d street down to their freight stations in the heart of the city; while for the underground railway lately organized in Brooklyn, and for the Broadway underground railway in this city, it may prove to be "just the thing."

EXPLOSIONS PRODUCED BY HIGH MUSICAL TONES.

The greater number of explosive agents contain nitrogen, which retains, with a very weak affinity, the element required for the combustion of the other ingredients; it resembles a spring which, when once set free, unwinds itself totally and suddenly. The starting of this spring is, in the case of gunpowder, gun cotton, etc., the heat-giving spark; with percussion powders, nitro-glycerin, etc., simply a shock is sufficient, while it has been discovered recently that there are substances which can be exploded by merely a sound of high pitch; such is the iodide of imidogen, easily made by placing pulverized iodine in liquid ammonia. In order to explain the reaction, we will state that there are three compounds of nitrogen and hydrogen: NH_3, ammonia, NH_2, amidogen, and N H, imidogen. The two latter are only formed in combination when one or two atoms of hydrogen are displaced by a third substance; so, when placing iodine in ammonia, two atoms of hydrogen combine with the iodine to form hydro-iodic acid, which dissolves a portion of iodine, forming a brown solution; while another portion of the iodine combines with the remaining N H, in which two atoms of H are displaced by iodine, and NH_3 becomes NHI_2; this forms a black powder, which is left as residue; when, after 15 minutes reaction, the brown liquid ammonia solution is poured off. The deposit is then filtered to free it from excess of ammonia; and, while wet, the filtering paper is divided into small pieces and dried separately, in order that any accidental explosion may not involve the whole mass.

There are other methods of making this compound. According to Mitscherlich, the iodine is dissolved in *aqua regia* and precipitated with an excess of ammonia, by which operation all the iodine is changed into NHI_2. According to Serullas, a saturated solution of iodine in alcohol is mixed with an excess of ammonia; then water is added, as long as it produces a precipitation of a black powder, which is again NHI_2. In this last form of preparation it is less explosive and less dangerous; while, if prepared by one of the former methods, the least pressure or friction causes the dry powder to explode, and it is a laboratory trick to distribute small particles of it while wet, on the floor of a room or hall; if, after drying, the people walk over it, a fusillade of small explosions is heard from under their feet.

The experiments to explode such powders by the rapid vibration of a high musical tone, were recently made by Champion and Pellet, and we have described them on page 20 of this volume. They form a valuable addition to the lecture room experiments.

The bromide of imidogen, produced by pouring bromine into ammonia, explodes much more easily, and, even at a distance, by any sharp noise; it is much more dangerous than the former. But the chloride of imidogen, produced by passing chlorine gas through liquid ammonia, is a liquid oily substance, and perhaps the most dangerous combination in existence. A single drop will explode most violently, on being merely touched with a greasy solid body. Berzelius gives a list of the bodies, upon the mere contact with which this formidable compound explodes. Undoubtedly it will go off by the vibration of the air produced by tones, but experments in this direction are still wanting.

POWER RAILWAY BRAKES.

The Honorable Mr. King lately introduced in the House of Representatives a bill to compel all railway companies to provide their cars with power brakes, so arranged that the engineer may, at any moment, apply power to the wheels of every car on the train. Penalties are provided against companies who fail to employ the device mentioned. The introduction of the bill was followed by an interesting speech by Mr. King, who presented many useful facts concerning railways, and railway brakes in particular, from which we take the following:

"Power brakes, operated from the locomotive, are a very old invention, although they were never adopted by any railroad company in the United States until about three or four years ago.

The Creamer brake is operated by the engineer, in cas only of an emergency, by pulling a cord extending the wh c

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length of the train. This releases the brakes, which are wound up after the fashion of an alarm clock. The hand brakes are used at all ordinary stoppings, the spring power being reserved only for an emergency.

The electric brake of Olmstead has been in use upon one train on the Erie railroad for some time, and works well.

The steam brake has a continuous line of pipe from the locomotive to the last car in the train; under the center of every car is a common steam-tight cylinder and piston; a branch from the long line of pipe communicates with the front end of all these cylinders; so that when the engineer turns a stopcock, the steam rushes like lightning through the train, enters the cylinders, and pushes the pistons outward, and thus applies the brakes to the wheels of every car in the rain. The air brake is the same thing, except that air does the work instead of steam.

To show the state of the art, and that the material exists by which this bill can be carried into effect, tables are appended to these remarks showing the names of inventors and the dates of their patents obtained both in England and the United States. The first power brake patent granted in this country was in 1847, and the total number granted up to the close of last year was fifty-nine. More patents on power brakes were granted in 1872 than from the organization of our Patent Office to the close of 1871, which strikingly illustrates the rivalry of the inventive genius of this country.

In England, from 1840 to 1866, there were patented twenty-two electric brakes; from 1835 to 1865, twenty hydrostatic brakes; thirty pneumatic brakes from 1838 to 1866, and fifty-four steam brakes from the year 1836 to 1866.

Henry Miller's steam brake, patented in 1855, was tried on a train of cars at Detroit, about that year, in the presence of several distinguished people; and a very interesting printed report of its operation and trial at that time may be found in the file containing his original application for a patent in the United States. But, for the fruits of his genius developed almost twenty years ago, it is to be regretted that he never received either honor or competent reward.

Seven companies for the manufacture of power brakes have been organized in the United States since 1869. And of the 444 railroads in the United States and Canada, more than one sixth of them have already been equipped with power brakes operated by the engineers.

On the Chicago and Northwestern railroad, by means of these brakes, a train of six cars, going at the rate of thirty-two miles an hour, was stopped in 19 seconds; the sametrain, going forty miles an hour, was stopped in 18 seconds, in 370 feet, or in less than one half the length of this Capitol building. The time in which to stop is the all-important consideration. It surely would take three minutes to stop a train going at this speed with the ordinary hand brakes. A minute in railroading is a very important matter."

Mr. King is hardly correct here. With handbrakes, properly and promptly applied, the train can be stopped as quickly as by the power brake. At a speed of thirty-three miles an hour a train can be stopped by hand brakes within a distance of 57 yards. At a speed of sixty-three miles an hour, within a space of 273 yards.

COLLAPSE FROM LOW WATER IN STEAM BOILERS.

A correspondent writes from Phelps, N. Y. to tell us of a somewhat remarkable and very interesting instance of a peculiar effect which may follow the overheating of a steam boiler in consequence of a deficiency of water. The case furnishes us an excellent text for remarks on the subject of "low water." A copper still, which had been in use, was, by some oversight, completely emptied while the fire was allowed to burn with undiminished intensity. It, as a natural consequence, quickly became red hot. While in this condition a quantity of cold liquid was run into it, when it instantly collapsed, being completely crushed in by the pressure of the atmosphere acting upon its exterior.

Our correspondent asks us to explain this, to him, most mysterious occurrence. Probably a very large majority of our most experienced and most intelligent engineers, if asked what effect should be anticipated in such a case, would say that there would be imminent danger of an explosion, and that a collapse could not, under any circumstances, occur. This case, however, is described by one of our readers, who gives us his name, and we cannot doubt the authenticity of the narrative. We can readily imagine, furthermore, how such an action might take place. A closed vessel used as a still, having pipes of small diameter for inlet and outlet, would, when the contents were drained off in the manner described, be left dry, but filled with highly heated aqueous vapor at atmospheric pressure. When the cold liquid was allowed to re-enter, this vapor would be likely instantly to condense, and before the atmosphere could enter through the contracted openings in sufficient quantity to equilibrate the pressure on the exterior, collapse might occur. This we presume to have been the case in the instance considered, and we have here another reminder of the falsity of the idea, formerly so prevalent and which is by no means yet extirpated from the minds of some of even the most intelligent men having charge of steam boilers, that "low water" must inevitably produce an explosion, and even that it is the principal cause of explosions.

Sixty years ago a crucial experiment was unintentionally tried by the then well known Captain Bunker, who commanded John Stevens' steamboat, Phœnix, the craft which is celebrated as having been the first steam vessel to make a trip in the open sea. In the year 1812, just before the memorable trip from this port to Philadelphia, which the venturesome captain made with young Robert L. Stevens, the boat was lying one night at the wharf, when, by some carelessness, the boiler became completely emptied of water On discovering this unpleasant state of affairs, Captain Bunker at once, as he testifies in the report of the Secretary of the Treasury, December 12, 1838, turned on the feed water. A crackling noise and some leakage, due to unequal contraction, were the only noticeable consequences. The same authority tells of a similar occurrence of which he was a witness which had no more serious results. Many such instances are known to have taken place, and the Franklin Institute of Philadelphia and individual experimenters have furnished ample evidence that, with low steam pressure, it is by no means certain, or even probable, that an explosion must be consequent upon a deficiency of water in the steam boiler. This prevalent theory, which was, as we have seen, disproved even before it had become a tradition, is too often made a scapegoat for those guilty of carelessness or recklessness in quite other directions.

It cannot, however, be too earnestly impressed upon those having charge of steam boilers that, although the majority of explosions are due to either ignorance or recklessness in working boilers too weak to bear the pressure to which they are subjected, low water may, and sometimes does, produce explosions. Iron heated to a red heat loses a large proportion of its strength, and at a white heat retains, practically, no cohesive force. A boiler under steam, therefore, if its heating surfaces become uncovered where liable to be overheated, will be apt to lose strength, as this overheating progresses until, at last too weak to sustain the usual pressure, an explosion takes place. It is thus that such disasters usually occur, and not, probably, in consequence of pumping cold water into empty but overheated boilers.

Where a boiler still contains some water below the line of overheated surface, the introduction of additional water may, in rare cases, by suddenly cooling a part having, a moment before, a very high temperature, produce new strains that may precipitate a catastrophe; since, in such cases the boiler cannot become, in effect, a condenser, as in the example which prompted this article. The additional quantity of steam generated under such circumstances may also result similarly. Low water may, therefore, produce either explosion or collapse, or it may cause no dangerous result, according to the peculiar circumstances of the case.

THE PROPOSED INTRODUCTION OF WATER METERS IN CITIES.

The city authorities of Brooklyn are manifesting some apprehension regarding the enormous waste of water in that city. That a vast and unnecessary drain is thus made upon the supply is fully evidenced by the fact that the amount now used averages fifty gallons per day for every individual of the population, and it is in view of the circumstanee that the present yearly consumption would soon exceed the capacity of the reservoirs, now 40,000,000 gallons, and necessitate the incurring of heavy additional indebtedness of the city, that the municipal government is seriously considering the introduction of water meters. It is estimated that the expense of these appliances, extending their use into families, would be about $1,000,000, and the yearly cost for repairs some $100,000. All manufacturing establishments in Brooklyn are metered at the present time, and are paying at the rate of two cents per hundred gallons.

We notice that the Commissioner of City Works makes reference to the fact that numbers of the water meters now in use have cost with their connections from $50 to $70 each. This sum, he justly believes, is unnecessarily high, and considers that suitable apparatus may be obtained at less figures. The subject of introducing water meters in New York has also been discussed for some time, and will eventually be adopted. It would be well for inventors to turn their attention to this matter, as there will be a large market opened for cheap and efficient forms of water meters one of these days.

THE INTERNATIONAL METRIC COMMMISSION AND ITS WORK.

The commission formed of delegates from thirty nations which met in Paris and was charged with the determination of uniform standards of weights and measures based on the French metric system has recently closed its joint labors. The countries represented were Belgium, Switzerland, Italy, Spain, Portugal, Prussia, Greece, Turkey, the Spanish-American republics, and English India, in which the French system is already in use; Austria, where it has been adopted since January 1st of this year, and England and the United States, which, without rendering the use of the metric standard obligatory, have admitted its legal employment in connection with the older method.

The Commission devoted its labor to the most exact examination of the standard in the French archives. The model was a platinum bar of one meter in length from end to end. It remained to determine whether the shocks to which it had been submitted during its repeated use in verifying other standards, or changes which might have taken place in its molecular construction, had not slightly altered its length, and whether its faces were absolutely true.

M. Fizeau, by a series of accurate investigations, showed that, while rules of iron and copper have varied in their construction in course of time, no similar property exists in iridiated platinum, which is analogous to the metal composing the bar in question; nor does this alloy ever vary in dilatability. This point was therefore first established. Attention was next directed to the extremities of the standard. Microscopic examinations were made, and, by the reflection of a filament of cobweb almost in contact with the polished surface, it was found that the latter was regular and had suffered no change. On the faces, the microscope showed among the circular lines, which proved the work to have been done by the processes of the lapidary, one apparently differing from those around it. In order to discover whether this facet had had any influence on the length of the meter, which it was necessary to be sure of to the one ten-thousandth fraction of a thousandth part, a very delicate microscope was constructed; and in order to measure this infinitesimal distance, the dust forming the globulous silica of the geysers of Iceland, and composed of little spheres perfectly regular to the hundredth of a millimeter in diameter, was employed. Through such accurate means as we have outlined, the length of the bar was determined not to have changed.

The Commission then decided that to constitute the international meter, of which a copy should be sent to the government of each nation represented, the meter in the French archives should be reproduced in exact *fac simile*, and made of iridiated platinum, that is, platinum containing one tenth part iridium, with a margin of two per cent more or less of the latter metal. The standard will be constructed as a line one meter long traced on a rule of 102 hundredths of a meter in length.

Investigations similar to those already detailed led the commission to adopt, for the type measure of weight, the kilogramme of the archives in its actual state. This standard will also be of iridiated platinum and a *fac simile* of the old one. The copies will be executed by the French section of the commission with the assistance of a permanent committee, who will minutely follow all operations to their completion and final verification by the conference.

THE SEWING MACHINE MONOPOLY.

To the Editor of the Scientific American:

Heaven bless you for opposing the reissue of patents to the great sewing machine combination! In our little hamlet of only a score of laborers' cottages, there are three cases which are eloquent petitions against it. In one, a soldier's widow with one crippled foot patiently uses the other to earn the exorbitant price of $87 which her Wheeler and Wilson has cost her. In another, a sad eyed young mother, deserted by a cruel husband, is at work by the week to pay the same price for a machine, assisted by her noble young brother of twelve years, for her wages alone are not equal to making the required monthly payments and clothing herself and child. In the third, is a young girl who has finished paying for her machine by daily labor in carrying off brick and making flower pots in a pottery which is the nucleus of our little cluster of humble homes. That her eyes were bright and her smile ever cheerful while earning the machine which was to assist in doing the sewing in her father's large family is no reason why she should spend weeks of toil in adding money to the purse of a millionaire.

These cases are not exceptional; there are thousands even worse all over the land, and in using your powerful influence against this grinding, pitiless monopoly, you take a position in the foremost ranks of philanthropists.

MRS. SARAH S. THOMAS.

Carbon Cliff, Ill.

The above is a fair sample of the results of the work of the monopoly known as the Sewing Machine Combination, the future existence of which depends upon the grant of new patent extensions by Congress. It is, as our correspondent demonstrates, from poor women that the greater portion of the profits are made.

We earnestly hope that Congress will refuse to entertain the extension. Poor people will then be able to buy sewing machines at reasonable rates.

THE Springfield *Republican* says: "The sewing machine ring is made up of the two Howe companies, the Willcox & Gibbs and the Wheeler & Wilson, Grover & Baker and Singer. The first three are all controlled by Mr. Stockwell, the new king of Wall Street, President of the Pacific Mail, Atlantic and Pacific, Samana Bay, etc. The ring are reported to have pooled up nearly half a million dollars to carry through a renewal of one of their representative patents. But it is a bad year for jobs at Washington. The members are becoming painfully virtuous or, rather, terribly scared. One of the sewing machine makers out of the ring predicts that, if the monopoly doesn't succeed in extending their patents, first class sewing machines will be down to $12 apiece within a year." The Troy *Times* adds: "We suspect that machines will not soon sell for a dozen dollars each. All the best machines cost more than that. But there is no sort of doubt that the most approved sewing machines might be sold, with reasonable profit, for $20 to $25. It is one of the heaviest taxes now imposed on the industry of the country, to lift the price of sewing machines by royalty from $30 to $60 or $65. We believe that nothing short of bribery will carry the proposed extension, of the patents about expiring, through Congress. Let the people watch their representatives upon this question."

THE ANNEXATION OF BROOKLYN TO NEW YORK.

The consolidation of Brooklyn and New York under a single municipality is being discussed in both cities. The union would prove of material advantage, as the business relations of Brooklyn are so closely connected with those of New York that it appears essential that both should be under the same government. The annexation of Brooklyn would probably be but the precursor of the absorption of other suburbs within the State into the corporate limits of the metropolis, thus giving to New York that vast increase in area, wealth and population to which, as the outgrowth of her prosperity, she is justly entitled.

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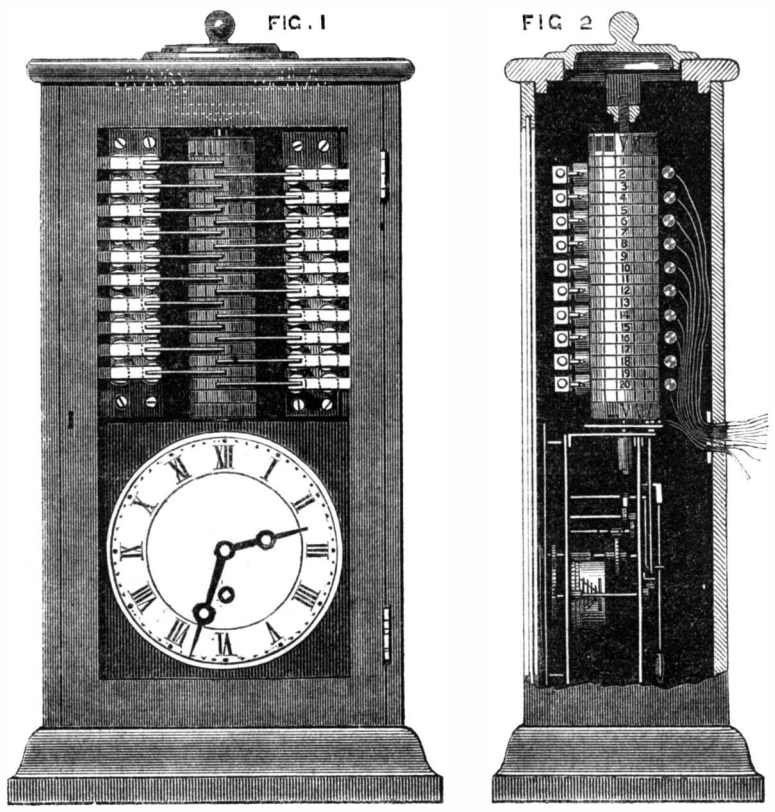
REGISTERING TELL TALE CLOCK.

This is an apparatus for checking a watchman on his rounds. Fig. 1 is a front elevation, and Fig. 2 a vertical section. A vertical revolving drum is placed in the center and is driven by the mechanism of the clock. To it is attached a sheet of paper divided perpendicularly into hours, and, by means of horizontal intersecting lines, into as many divisions, counted vertically, as there are localities to be visited. Each vertical division has a marker actuated by an electro-magnet placed on either side of the cylinder. The wires are led through the back of the clock to the different stations, at each of which is a knob which must be pressed at the time of the visit. A circuit is thus completed, the armature of the electro-magnet attracted, and a vibrating motion imparted to the marker, the point of which impresses a dot on the paper through the medium of a piece of carbonized ribbon. If, says *Engineering*, the watchman fails to visit any point on time, the cylinder in the interval will be carried on, so that a blank space will appear on the sheet and thus prove the neglect. Fresh paper can be substituted when required. The clock is placed beyond the reach of the watchman, and inspection in the morning reveals the fact as to whether he has been negligent or punctual in his rounds.



REGISTERING TELL-TALE CLOCK.

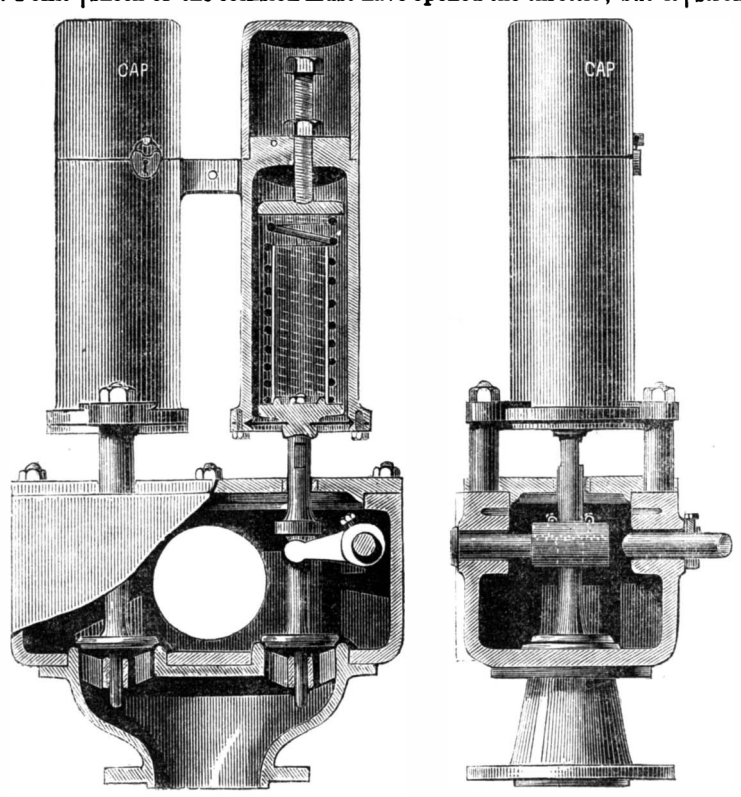
Camphor Wood.

Mr. J. Meldrum, Managing Director of the Johore Steam Saw Mills Company, at Johore, India, forwards to us various interesting particulars regarding the use of camphor wood, which, he states, may be applied to all purposes for which teak is used. The camphor tree belongs to the order *guttiferæ*, and grows without cultivation in the woods near the sea coast. It is frequently found upwards of 15 feet in circumference, and high in proportion. For carpenters' work the wood is much esteemed, being easy to work, light, durable, and not liable to be injured by insects; and it retains a pleasant and agreeable smell. It is especially suitable for shipbuilding and for the construction of wharves and jetties, as it is not destroyed by sea worms. Piles of this wood, in a comparatively good state of preservation, exist on the site of the old town of Johore, which was abandoned upwards of 100 years ago.

Our correspondent forwards a detailed report of tests made of this material, as regards strength, weight, etc. The breaking strain of a piece 3 feet long by 1¼ inches broad, and 1¼ inches wide, was 1,344 pounds. Its weight is 70 pounds per cubic foot. Large saw mills have been erected in Johore for the purpose of preparing this valuable timber for exportation.

IMPROVEMENT IN SAFETY VALVES.

Our engraving shows an arrangement of spring loaded safety valves for marine boilers, designed by Messrs. Pollit and Wigzell, of Sowerby Bridge, England, and lately applied by them on board a steamship which they are fitting with engines. It will be seen from the illustrations, says *Engineering*, that the valves are of the ordinary form, and are fitted with the usual lifting gear; but on the top of the valve box are fixed two cylindrical casings, each containing a helical spring which bears upon a disk carried by the spindle of the corresponding valve. The lower ends of these spring casings are kept air and water tight by india rubber disks secured as shown, while at the upper end, each casing is fitted with a cap secured by a bolt and padlock, this cap preventing the spring from being tampered with. The valves are quite free, and can be turned round by the two flat places formed on the spindles just above the valve box cover. The arrangement is a very simple one, and the plan of protecting the spring by means of an india rubber disk, which closes the mouth of the spring case, and at the same time does not interfere with the play of the valve, is, we believe, novel.



IMPROVED SAFETY VALVE.

The Hoosac Tunnel Mineral Water.

Large pockets of water have been opened at the west heading of Hoosac Tunnel during the past week, keeping the miners completely drenched. More than a year ago it was discovered that the water at the west end possessed medical properties, so that the workmen have avoided using it as a drink, choosing to be provided from a clear spring nearer the shaft and next to the mule stables. One tumblerful of this water proves an active cathartic; it leaves the skin soft and pliable when applied for washing without soap. A plentiful deposit of a soft substance is found in the crevices of the rocks, and when dried is an impalpable powder. Since the gushing out of this water in such quantities, it is proposed to have an analysis of it, and to make some further experiments to ascertain its virtues.

The Creeping Rail Question.

A correspondent, J. S., suggests that one rail of a track may be extended beyond the other by the trains in one direction being the heavier, as coal trains, which are loaded from the pits and empty when returning, usually are. But as this fact would apparently affect both rails of the track, J. S. says that a diurnal side strain, produced by the rotation of the earth, would cause trains in both directions to press on one rail more than on the other, on a single track. C. T. and others have also written their opinions, and they attribute the phenomenon to the motion of the earth. But none of them recognize the fact that this is the first instance of the kind on record, and that the two rails of a track are not sufficiently far apart for any such cause to lengthen one and not the other.

A Singular Railway Accident.

Recently, on the Hudson River Railroad, at Yonkers, N. Y., a freight train came in collision at the depot with an engine which was on a side track. The engineer of this engine jumped off just previous to this collision, having, as he says, shut off steam. No sooner had the collision occurred than off started the said engine northerly, with no one on board. It soon acquired a fearful velocity and at the next station, three miles distant, plunged into the rear car of a passenger train standing at Hastings depot, and made sad havoc. The car was split half open, telescoped upon the next car, etc. Two persons were mortally hurt, and others injured. The engineer of the runaway engine says that the shock of the collision must have opened the throttle; but it seems more probable that the gear was reversed by the engineer and steam let on before he jumped off. The collision was due to the non-observance of the danger signals by the engineer of the freight train.

A GOOD trade is always a comforting companion to travel with, a something that a man can fall back upon in time of need, and yet it does not preclude him from entering upon some profession, if his inclinations or genius develope the proper capacity. In fact, our most successful business men in almost every capacity are from the workshops and farms.

THE best linseed oil is yellow, transparent, and comparatively sweet scented, and has a flavor resembling that of the cucumber.

New German War Ship.

The Imperial German Admiralty recently decided to build three armor-clad vessels, the Grosser Kurfürst, the Friedrich der Grosse, and the Borussia; the two former are being built at the Imperial docks of Wilhelmshaven and Kiel, whilst the latter vessel, the Borussia, has been ordered of the Vulcan Engineering company, at Bredow, near Stettin.

The Borussia is an armored-turret ocean-going ship, and has a length between perpendiculars of 308 feet 6¾ inches, the greatest length being 318 feet and 2 inches, with a breadth of 53 feet and 6½ inches, and a depth of 34 feet 10 inches, from upper deck to keel. The displacement of the vessel, completely armed and fitted, will amount to 6,748 tuns. The draft of water in sea-going order has been fixed at 23 feet 8 inches amidships. An armored casement surrounds the two turrets, which project 6 feet 2 inches above the upper deck; this casemate is separated from the fore and aft part of the vessel by armored transverse bulkheads, whilst these parts are protected only between wind and water by an armored belt reaching from about 6 feet 2 inches below water up to the battery deck.

The turrets, the port sills of which are 13 feet 5·4 inches above the water line, will be armed each with two 10·23 inch naval guns of the newest construction, and are to be moved either by separate engines placed between the decks, or by manual power. Besides the four guns in the two turrets, both in the forecastle and in the stern a 6·69 inch gun will be placed. The funnel is situated between the two turrets, and is thus protected, by the latter and the armor plates of the casemate, to the hight of the turrets, against the enemy's fire.

The bow forgings, with the spur in two pieces connected by a joint plate, will weigh about 18 tuns, whilst the stern post, which, welded together with the rudder post, forms a large frame, will have a weight of about 30 tuns.

The arrangement of the connection between the various parts of the Borussia will give her a great strength with a comparatively small weight of hull. She will be constructed with a double and watertight bottom.

During action the chief protection will be offered to the vessel by the armor, which rests with its lower edge upon the armor framing about 6 feet below the full load water line; the thickness of the armor will be 18·50 inches. The armor plates at the water line are 9·25 inches thick, below the water line 7·28 inches, and above water 8·26 inches; these thicknesses decrease towards the ends to 4·13 inches. Before the fastening of the armor plates, the inner skin is covered with a backing of teak about 10·23 inches thick, but varying with the thickness of the plates; angle irons are used for fastening this layer of teak to the outer skin. The armor plates are fastened by means of strong bolts 2½ inches diameter with conical heads fitting exactly in corresponding holes of the plates. The nuts of the bolts of the armor plates are provided with double washers, between which a thickness of rubber is placed in order to prevent as far as possible the tearing off of the bolt heads when the armor plates are struck by shot. The armored cross walls have plates 5·11 inches thick with a backing of teak 8·26 inches thick.

The two turrets, each of 26 feet 9 inches diameter, will be constructed of plates and angle irons; they extend, as already stated, from 6 feet 2 inches above the upper deck to the battery deck, and are covered with armor at the parts only exposed above the upper deck. The plates of these turrets are 8·26 inches thick, with the exception of those through which the porthole for the gun are cut, and which have a thickness of 10·23 inches; the backing of teak in the turrets is only 8·26 inches thick.

The following are the weights of materials used for the hull of the vessel, the masts, and the turrets:

	Tuns.
Plates	1,375
Angle iron	600
Bar iron and large forgings	330
Iron for rivets	115
Cast iron	100

It is expected that the Borussia will be launched during this month.

Street Architectural Laws of Paris.

The hight of the facade of buildings on the public streets of Paris is determined by the width of the streets. This hight, measured from the sidewalk and taken in every case in the center of the facade cannot exceed, including entablature, all stone and all construction pertaining to the front wall, the following rules, namely: 38 feet in hight for streets less than 26 feet wide; 48 feet in hight for streets 26 to 32 feet in width; 58 feet for streets exceeding 32 feet in width; and for boulevards, and streets exceeding 65 feet in width, the municipal authorities shall be able, for the sake of proportion and harmony in the lines of construction, to permit the hight to be carried to a maximum of 65 feet, upon condition that in no case shall the building have more than five full stories above the first story. The outline of the roof on the street front shall not project beyond a line drawn at an angle of 45° from the cornice of the facade.

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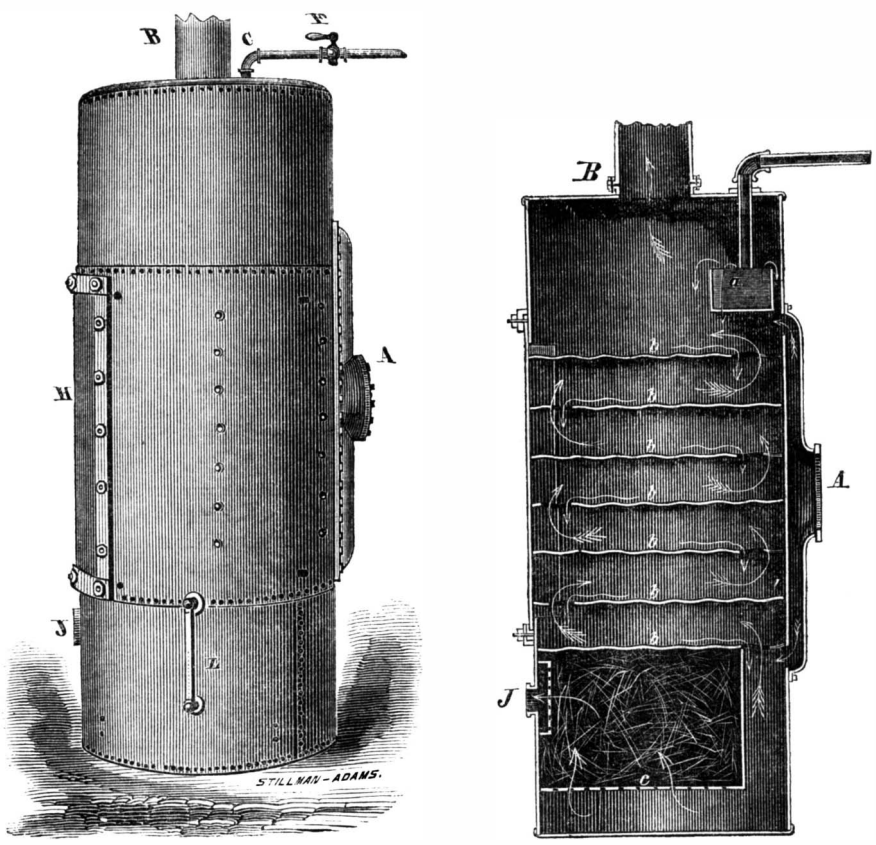
STILWELL'S LIME EXTRACTING HEATER AND FILTER.

The object of the invention, which we illustrate herewith, is to remove all foreign substances which produce scale from feed water before it enters the boiler, so that the water is supplied to the generator in a perfectly pure condition. The operation of the heater will be readily understood by reference to the sectional cut. The escape steam coming from the engine is divided and enters the apparatus in two currents. The upper current meeting the cold water as it flows in a thin sheet over the edges of the overflow box, dashes it into spray, and sets free the earthy salts held in solution, which are deposited upon the shelves. The lower current of steam enters beneath and meets the descending water as it passes from shelf to shelf, completing the work of thoroughly boiling the water. The water in passing over the large area of surface contained in the shelves deposits upon them all that portion of the salts held in solution that will crystalize. It then descends to the bottom of the heater and up through the filtering material contained in the chamber, *c*, which relieves it of all mud, sand, and other impurities, the water leaving the heater, at J, boiling hot and pure. The door, H, is held in place by rabbeted bars and can be taken off in a moment and the shelves all drawn out, thus giving ready access to every inch of the heater, and rendering its cleaning a short and easy task.

The device is claimed to be an established success, over 3,000 being now at work. We are informed that it has been fully tested over a period of nine years, and that it is guaranteed by its makers to completely prevent incrustation. It is considered especially suitable for use in southern and western sections of the country, where the water is almost uniformly impure. Several patents have been granted upon this invention, the latest of which is dated August 3d, 1869. Further particulars may be obtained by addressing the Stilwell & Bierce Manufacturing Company, Dayton, Ohio.



STILLWELL'S LIME EXTRACTING HEATER AND FILTER.

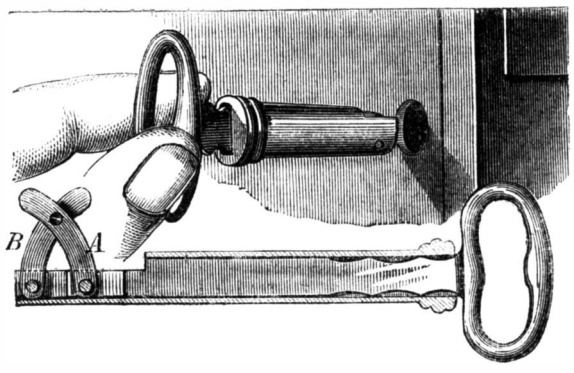
LOCAL BOILER INSPECTION.

In our paper for February 22, a correspondent, Mr. T. Leon Chester, asserts that the State law for boiler inspection has been repealed. But notwithstanding the repeal, some of the deputies, so our correspondent alleges, are going about in Westchester county, inspecting boilers and demanding six dollars for such inspection. Is it not a fraud, he asks, to make manufacturers, brewers, etc., pay for inspection under a law which is not in existence?

Mr. John Worthington, who is the deputy inspector for the tenth Congressional district, which embraces Westchester, Rockland and Putnam counties, calls our attention to the fact that Mr. Chester has made a gross mistake. The law has not been repealed but is still in force, and Mr. Worthington is regularly engaged in the discharge of his duties as inspector, which we have reason to believe are faithfully and skillfully performed. Of course no one who knows Mr. Worthington would for a moment suppose him capable of being a party to the practice of a fraud. We think that our correspondent was very culpable in not looking to see whether the law had been repealed before making so positive an assertion in respect thereto, and in casting an aspersion upon the inspector of the district. It appears that a bill was introduced into one of the branches of the legislature looking to a repeal, but the bill failed to pass.

A NOVEL FORM OF KEY.

The key represented in our illustration is composed of four pieces of metal so combined as to form a perfect device, and to be used in any lock constructed with reference to its peculiar form. The bow or handle is attached to a stem which slides freely in a sheath. Pivoted to the latter by a rivet is the curved piece, A, while the similar piece, B, is secured in



like manner to the stem. Both pieces are connected together by a pin, and form a movable bit, which is thrown out or in as the handle of the key is pushed from or drawn toward the operator. By this means, when the bolt of the lock is properly constructed, it will not be necessary to turn the key at all to unlock the door, as the bolt is forced back simply by an inward pressure of the key bow. This novel device is the invention of Mr. Addison A. Stuart, of Cedar Rapids, Iowa.

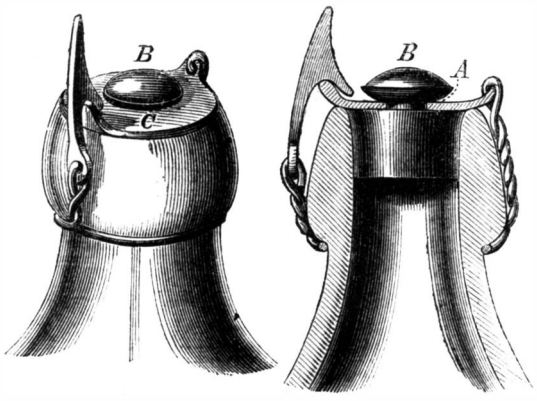
THE Western Union Telegraph Company has purchased the control of the telegraph cable between Florida and Cuba.

A Variety Manufactory.

In the city of Buffalo, N. Y., there is a large manufactory devoted to the construction of a remarkable variety of useful and curious machines and novelties. We allude to that of Mr. Parr, whose labor saving machines, tool chests, carpenters' and gardeners' implements, mathematical and artists' appliances, and a great variety of other articles are described more fully in our advertising columns. In addition to the above, he has recently added to his stock small stationary, marine, locomotive, and fire engines, and steamboats; also all the various implements used in fabricating Sorrento work, which has become quite a fashionable employment among amateurs and ladies of industrious and mechanical proclivities. Boxes of assorted chemicals, with directions for performing amusing and instructive experiments, are among Mr. Parr's latest novelties. One of the larger boxes contains some 150 different chemicals, making quite an extensive portable laboratory for simple experiments. To enumerate and describe all of the articles of utility and novelty made and sold at this manufactory would occupy several columns of newspaper space. We would recommend parties to send 25 cents to Mr. George Parr, Buffalo, N. Y., and obtain a copy of his illustrated catalogue. They will find it entertaining, even if they do not wish any of his goods.

A NEW BOTTLE STOPPER.

Mr. William Morgenstein, of New York city, is the patentee of the ingenious device, for closing the mouths of bottles,



represented herewith. The stopper is made of india rubber, cork, or other elastic material. Around its upper portion a recess or groove is cut, as at A, so that when the head, B, of the stopper is pushed through a hole in the supporting plate, C, the latter, engaging in the recess, firmly retains the stopper in place. The wire represented is passed through an eye on the plate and made into two loops, opposite to each other, to one of which is attached a cam-shaped catch. The latter presses over a raised lip on the plate, C, holds the same down and thus securely closes the bottle. By forcing the catch back, the supporting plate is released and the stopper can be readily withdrawn.

What Our Friends Think of the Scientific American.

An esteemed correspondent, writing from Mound City, Ill., sends us a variety of useful items and says: "I send these items partly to gain instruction, and partly to instruct others; you will read them and give place to such as are worthy to be in the SCIENTIFIC AMERICAN, the 'paper of papers.' I do not like to run any risk of doing without a single number, because this paper helps me to support my family. True, it does not bring greenbacks tacked to its edges, or family groceries in its folds; but by carefully reading the valuable matter in its columns, I am better able to manage, operate and control the machinery with which I earn my livelihood."

SELF-LIGHTING SIGNAL LANTERN.

In 1871 we described a signal lamp, invented by Holmes, which, on immersion in water, was self-lighting, and produced a brilliant illumination. Its principle rests upon the use of phosphide of calcium which, in contact with the water, developes spontaneously combustible phosphureted hydrogen gas. A German engineer has recently been experimenting with this lamp. A long tin tube, firmly closed, in which were contained 900 grains of phosphide of calcium, was kept afloat upon the water by being fastened to a piece of board. Before putting it into the water the bottom of the tube was perforated to allow the water to enter, and the upper point cut off so that, on the entrance of the water, the self-lighting phosphureted hydrogen gas was developed.

A flame, four or six inches broad and 24 inches high, lighted up the steamboat and pilot boat, which had gone out four miles on the sea with a party to witness the experiments, so brilliantly that the vessels and men upon them were distinctly visible from the lighthouse at that distance. In a tolerably heavy swell the flame was preserved for three quarters of an hour, and appeared at the distance of one or two miles like a strong signal fire. In the immediate vicinity, for a distance of 28 yards, the light was strong enough to allow of any work being done. For pilot and wrecking service, this signal fire can be highly recommended.

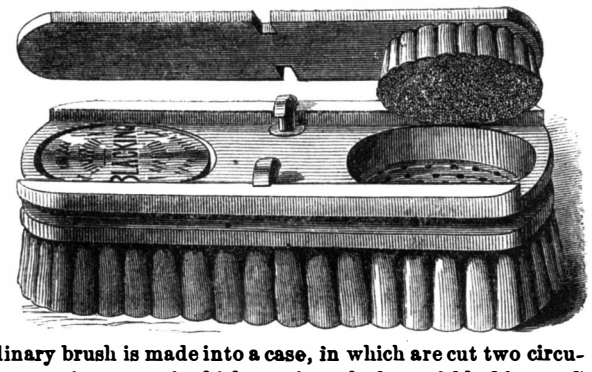
The preparation of the phosphide of calcium can be accomplished as follows: In the lower part of a narrow deep crucible, a hole is drilled for the reception of the neck of a flask, which is luted into the aperture; a quantity of dry phosphorus is placed in the flask, and the crucible is filled with quicklime broken into fragments of about the size of a hazel nut; a lid is then luted upon the top of the crucible. Time having been given for the luting to become dry, the upper part of the crucible is raised to a red heat as quickly as possible by surrounding it with ignited charcoal, the lower part of the furnace having been filled with cold charcoal to prevent the heat from reaching the phosphorus too rapidly; the phosphorus becomes gradually volatilized as the heat reaches it.

If the heat be too high, the phosphorus distils over without combining with the calcium. The phosphide of calcium, when procured in this manner, forms an anhydrous mass of a dull red color, hard enough to strike fire with steel; it experiences no change in dry air or in oxygen at the ordinary temperature. At a high temperature it becomes partially decomposed by oxygen, chlorine, or hydrochloric acid; in a moist atmosphere it slakes, emits phosphureted hydrogen, and crumbles to a brown powder. The phosphide of calcium, in its insulated form, is decomposed when thrown into water; phosphuretted hydrogen gas is evolved, which takes fire spontaneously. It is necessary to keep the preparation in hermetically closed vessels. Where the phosphide is required to be attached to life preservers or signal buoys, it can be inclosed in tubes which are stoppered with some salt that will dissolve off in contact with water. In case of a man overboard in the night, his position could be detected by the employment of floating grenades of phosphide of calcium thrown from the ship.

It has been stated that, by fusing magnesium filings and phosphorus together, a compound results which can be employed as a substitute for the phosphide of calcium in the evolution of phosphureted hydrogen gas. As magnesium can now be procured in considerable quantity, this method may be worthy of a trial.

COMBINED BLACKING BRUSH, BOX, AND HOLDER.

This device is especially adapted to the needs of travelers, as it enables two blacking brushes and box of blacking to be stowed in very small compass, without danger of soiling any article which may be near them. The handle of an ordinary brush is made into a case, in which are cut two circular mortises, one of which receives the box of blacking and the other the bristle portion of the dip brush. The handle of the latter closes the recess, forms a cover, and is secured in place by the two buttons shown. The dip brush is reversible, and fits on either of the circular mortises. To Mr. E. W. Woodruff, of Washington, D. C., is due the credit of this useful little invention.



THE rate of telegraphing between this country and Europe is one dollar a word; but the price is to be reduced on the 1st of May, next, to 75 cents per word.

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Correspondence.

The Recent Boiler Explosions.

To the Editor of the Scientific American:

We notice, in your issue of February 22, an article on boiler explosions at Conshohocken, Pittsburgh, and elsewhere. The information in regard to our lamentable catastrophe appears to come from Mr. Le Van, of Philadelphia, and as we know you well enough to believe that you do not wish to misrepresent or injure any one by a false report, we give you the facts in the case: The boiler was ordered and made in 1853, and was put in use in 1854. It was of the best charcoal flanged iron, the shell being of the thickness of No. 2 wire gage, and the flues were ¼ inch thick. The boiler was 54 inches in diameter, 18 feet long; the flues were 16 inches in diameter, and not 18 inches; the shell is fully ¼ inch now, and the flues are very little under the original thickness. The quality of the iron has been pronounced, after testing since the explosion, to be very superior, and not poor and crystallized. It will bend or flange either when hot or cold, without showing the smallest fracture, and it will stand a tensile strain of 70,000 lbs. to the square inch, which is 20 per cent stronger than ordinary shell or cylinder iron, now used for boilers, is. Your informant also says: "It exploded whilst the steam gage showed only 53 lbs." The fact is that there was no steam gage attached to the boiler, as it was shut off from the rest, having been stopped for repairs. The engineer, who had had charge for 10 years, was under the impression that the steam was not high enough to open the valve to equalize with the other boilers, as it was not blowing off at the safety valve; and he was preparing to open it when the explosion took place. The boilers that were at work at the time were carrying 70 lbs. as indicated by the steam gage. We cannot see how Mr. Le Van arrives at the conclusion that the boiler exploded at a pressure of 53 lbs., or how he or any one could say it was 53 or 153 or more. Who can tell whether the safety valve was stuck or not, or how much pressure was on it, or what was the real cause? We would give a good deal to know. We are under the impression that this boiler would have carried 150 lbs. pressure without exploding, and, from the terrible results shown, it must from some cause have had more on it. The manner of firing and starting in this case was the same as had been followed for 20 years, without a single accident or the loss of a single life. It really seems unaccountable to us. Many flying reports and rumors have been put in circulation by the reporters of some of our sensational newspapers, who catch at every thing without knowing anything about the facts. It would be foolish in any man to suppose that we would risk our lives, the lives of our workmen and our property by running a boiler that there was the least reason to suspect of being unsafe.

I. WOOD & BROTHERS.

Philadelphia, Pa.

Ignition by Steam Pipes.

To the Editor of the Scientific American:

In your issue of February 8, you publish a communication from A. F. Nagle, Mechanical Engineer of the Providence Waterworks, which, although true in every fact stated, does me great injustice by not stating all the facts; and it must lead to the conclusion that the Miller boiler is dangerous, as it will set buildings on fire when other steam generators would be perfectly safe. I would therefore request the insertion of this communication as an act of justice, as well as for the further light it may throw on the question of superheated steam.

The pumping engines at the Providence Waterworks, as Mr. Nagle states, are covered with felting and black walnut lagging; this lagging has been repeatedly saturated with linseed oil, rubbed down till it had acquired a fine finish. The engine is one of Worthington's compound cylinder engines, in which two cylinders are placed horizontally side by side; the steam chest is situated between the two cylinders and above the same; and the lagging generally, conforming to the cylindrical shape of the engine, forms here a square box with a level top. In this top was a trap door; and in the square box, below this door, the fire originated. The engines were new, the lagging was new and had not yet reached the perfect finish which the engineer expected to see on it when it would be more thoroughly saturated with oil and rubbed down. The level top of the steam chest and the joints of the door certainly facilitated the admission of oil to the felting; and when you consider that this felting was over the level surface of the steam chest (where the effect of heat would be greatest) and that this level surface was a convenient place for a temporary deposit of oily waste when wiping up the engine, it is evident that here spontaneous combustion would be most likely to take place. That the higher temperature of the steam from the Miller boiler may have facilitated the ignition, I am ready to concede, but must object to the inference that it caused the ignition of the felting. The steam generated in the Miller boiler, before reaching the steam chest, had to ascend the main steam pipe four feet, thence, pass on a level through the said main over the tubular boilers (some sixty feet), and then descend 8 or 10 feet to the steam chest. The whole length of this pipe is felted and well lagged, and the temperature of the steam in this pipe must, of necessity, be greater than in the steam chest, being from 8 to 10 feet higher, and from 40 to 80 feet nearer the source of heat; and yet this steam chest, with every provision for spontaneous combustion and every probability of a lower temperature than the steam main, is the place where the fire originated.

But unfortunately, to most of your readers, the ugly fact still remains, that the steam of the Miller boiler was superheated beyond the temperature at which saturated steam would have been at this pressure; and this is the difficult part of my defense. You, Mr. Editor, and most of your readers, are aware that I have frequently, in your columns, expressed my conviction that the amount of water, passing through a steam boiler per pound of coal burned, is no criterion as to its value as an economic generator of steam. We do not want to evaporate water; we want to get the largest amount of power from the smallest amount of coal, and it is a well known fact that the motor in which the difference of temperature between the inlet and exhaust is greatest produces the most economical power. The Miller boiler erected at the Providence Waterworks was specially constructed to test the question whether it is, in reality, economical to generate steam on my system, in which the water is progressively exposed to increasing temperatures until made into steam, this steam, dried and superheated, instead of being stored up in large steam domes, being at once sent to the engine to do its work. The lifting of a certain quantity of water from a given level to another higher one being the most perfect and satisfactory test, I spent a large amount of money, besides time, care and labor, to settle this important question, which must be valuable to the engineering as well as to the manufacturing community. I therefore ask you to publish the results of this trial, sent herewith; and your readers will see if the test proves that dry and even superheated steam is economical. If asbestos be used instead of fet,l no danger from fire need be anticipated. In conclusion, let me say that many of our largest establishments are using steam generated by the Miller boilers; and a Corliss engine will cut off at 65 lbs. when using this steam, but will not cut off with 85 lbs. using ordinary steam, doing the same work. These boilers have been in use for two years and over, varying in power from 75 to 500 horse power; and in no case have they suffered from the high temperature, nor have any fires ever been caused in any of the establishments using them.

Whether the burning of the lagging in this case was caused by the steam or by spontaneous combustion, I leave to the intelligence of your readers to decide; whether dry steam is a desideratum, the trial must establish.

JOSEPH A. MILLER, C. E.

TRIAL OF THE COMPARATIVE ECONOMY OF TUBULAR AND MILLER STEAM BOILERS, DOING THE SAME WORK THROUGH THE SAME ENGINE AT THE PUMPING STATION OF THE PROVIDENCE WATERWORKS, AUGUST 14 AND 22, 1872.

Date.	*Tubular.*	*Miller.*
Elevation of center of engine	23·062	
Mean elevation of water in river	7·993	9·878
" " " inlet chamber	179·420	179·660
Steam pressure in lbs. per square inch	61·75	63·30
Water " " "	70	70
Vacuum, inches	[illegible]	26·5
Temperature of river water Fah.	[illegible]	77°
" " hot well "	122°	120°
" " feed water "	131°	128°
" " flue to chimney, Fah.	257°	247°
Weight of a cubic foot of river water, pounds	62·19	62·22
" " feed water, "	61·55	61·57
DUTY BY CORNISH RULE.		
Volume swept through per minute, cubic feet	337·355	433·600
Resistance, lbs. per square foot	10·731	10·753
Work done per minute in foot pounds	3620·157	4662.501
Coal consumed per minute, pounds	9·366	7·667
Work done per 100 lbs. of coal in foot pounds	38652·000	60815·000
" " combustible	46254·000	72757·000
Water evaporated per minute, pounds	78·113	72·174
Work done per lb. of water evaporated, foot pounds	46·345	64·601
DUTY BY WEIR MEASUREMENT.		
Volume swept through per minute, cubic feet	306·002	422·844
Resistance, lbs. per square foot	10·731	10·753
Work done per minute in foot pounds	3283·707	4546.844
Coal consumed per minute	9·366	7·667
Work done per 100 lbs. of coal, foot pounds	35060·000	59,306·700
" combustible, foot pounds	41955·000	70,952·000
Water evaporated per minute, pounds	78·113	72·174
Work done per lb. of water evaporated, ft. pounds	42·038	62·998
COMPARATIVE RESISTANCES.		
Pressure in pump by indicator, lbs. per square inch	68·25	
Calculated resistance of delivery valves " "	0·55	
Pressure in main by indicator, lbs. per " "	67·70	
Correction for difference of levels	0·69	
Pressure in main, by indicator, corrected by level of gage	67·01	
Pressure in main by gage	70·	
Discrepancy, lbs. per square inch	3·	
Hight of indicator above river, feet	15.819	
Calculated friction in suction main	·046	
Total resistance " "	15·865	
" in lbs per square foot	·987	
Pressure in main by indicator, in lbs. per sq. foot.	97·49	
Total resistance in lbs. per square foot	107·36	
Hight of water at inlet chamber above river, feet	171·427	170·782
Calculated friction in mains	1·004	1·907
Resistance in check valve in force main, feet	0·12	0·13
Total head	172·551	172·819
" lbs. per square foot	10731	10753
COMBUSTION AND EVAPORATION.		
Area of grate, square feet	55·00	57.5
Coal consumed per hour per square foot of grate	10·217	8·00
Water evaporated per lb. of coal	8·34	9·41
" " combustible	9·98	11·26
" to and from 212° per lb. of coal	9·25	10·47
" " " combustible	11·07	12·53
CAPACITY.		
Net area of plunger in square feet	2·60965	
Average length of stroke, feet	3·895	3·875
Number of strokes per minute	33·18	42·88
Speed of piston per second	1·077	1·3845
Gallons pumped per 24 hours	3296·000	4554·640

REMARKS BY THE EDITOR.—When we published the letter of Mr. Nagle, we stated in our comments that the combustion which he attributed to the steam pipes was probably due to the presence of oil, either in the wood casing or the felting. Mr. Miller's statement confirms our supposition, and conclusively shows that the case is properly to be classed among examples of spontaneous combustion due to the presence of oil in combustible materials.

We do not think that any of our readers would be apt to regard Mr Nagle's letter as in any sense damaging to Mr. Miller's boiler. If so, any such idea will be removed from their minds on examining the very full and satisfactory report of the boiler trials, which Mr. Miller gives above.

Sulphite of Lime in Cider.

To the Editor of the Scientific American:

Your correspondent, William A. Barnes, on page 4 of the current volume, says that if I will study the chemical effect of sulphite of lime, I will see that it has no disposition to appropriate the oxygen already combined. If I understand the philosophy of breathing, free oxygen is absorbed by the blood in its passage through the lungs, which afterwards, while passing through the capillaries and other blood vessels in all parts of the body, combines chemically with fatty and other combustible matter, producing heat and carbonic acid. Or, in other words, the oxygen absorbed through the lungs supports the combustion that furnishes the animal heat, at the same time burning out from the blood certain waste products which would prove injurious were it not for this means of purification. As most substances, after being digested in the stomach, are carried by the lacteals to the blood vessels, I thought the sulphite might rob the blood of a portion of its free oxygen, but from an experiment that I have since made, I think that it does not do this to any considerable extent, if at all.

So much for theory; now I will give my experience. Last fall, I procured a pound of sulphite of lime in three packets, marked with the name of a well known chemist, and said to contain the proper quantity for one barrel. I treated several gallons of new cider with the quantity of the sulphite indicated by the directions. It did keep the cider from getting sour, but it in a great measure destroyed the flavor of the cider, beside imparting a disagreeable taste of its own. After exposing some of the cider in an open tub for about six weeks, it has nearly lost the taste of sulphite of lime, but has not in my opinion half the flavor that it had when new. The sulphite was marked neutral, and it did not change litmus paper. A mouse, fed on dough made of Graham flour with one part of the sulphite to three or four of flour, died in about thirty-six hours; and on a repetition of this experiment, another mouse died in about the same length of time, while a third mouse in another cage fed on a similarly prepared mixture of *sulphate* of lime remained healthy.

I attempted to test the excrement of one of the mice for starch, to find if the sulphite interfered with digestion, but found that the sulphite would mask any reaction with iodine, even after the addition of boiled starch. And on further experiment, I found that the sulphite would instantly destroy the blue color of iodide of starch. Can you explain this reaction?

HENRY A. SPRAGUE.

Charlotte, Maine.

REMARKS BY THE EDITOR.—Where an excess of sulphite of lime is used, some of it dissolves and imparts a disagreeable flavor, and may prove dangerous. If pure sulphite is taken in proper proportions, it prevents fermentation by absorbing free oxygen, and is changed to the sulphate, which settles to the bottom. The blue iodide of starch was bleached by the sulphurous acid of the sulphite; and to prevent this, only minute quantities must be taken. The same reaction takes place when we liberate iodine from iodide of potassium by means of chlorine. The blue color will disappear in an excess of chlorine. The experiments of our correspondent seem to show that sulphite of lime is fatal to lower animals and to indicate the necessity of using no more to keep cider sweet than will be at once converted to sulphate.

ASTRONOMICAL NOTES.

OBSERVATORY OF VASSAR COLLEGE.

For the computations in the following notes (which give only approximate places), I am indebted to students.

M. M.

Position of Planets for March, 1873.

Mercury.

On the 1st of March Mercury rises at 7 A. M. and sets at 6h. 20m. P. M. On the 31st it rises at 5h. 53m. A. M., and sets at 7h. 12m. P. M.

According to the *American Nautical Almanac*, Mercury has its greatest elongation on the 18th. It souths at that time an hour after noon, and should be visible after sunset.

Venus.

On the 1st Venus rises at 8h. 12m. A. M., and sets at 9h. 48m. P. M. On the 31st it rises at 6h. 57m., and sets at 9h. 57m.

According to the *American Nautical Almanac*, its greatest brilliancy is on the 29th of March.

Mars.

Mars rises on the 1st a little before 11 P. M., and sets at a little after 9 A. M. On the 31st it rises at 9h. 5m. P. M., and sets at 7h. 20m. A. M.

Mars has become more conspicuous from its increasing diameter, and is a very noticeable object in the early morning.

The star *Antares*, which resembles Mars in its reddish light, is well seen at the same time, east of Mars some 24° and south of it (when on the meridian) about 12° on the 1st of March.

Jupiter.

Jupiter rises on the 1st of March at 4h. 16m. P. M., and sets at 6h. 6m. A. M. On the 31st it rises at 2 P. M., and sets at 4 in the morning.

On the evening of February 4th, the fourth satellite of Jupiter was seen to pass across the disk of the planet. Being between the earth and the planet, it seemed to be projected upon the planet, as a grayish brown spot, not quite circular in shape; as it left the planet's disk, it seemed, for more than three minutes, to hang upon the limb.

The third satellite, at about its greatest distance from Jupiter, showed, through the large telescope, a disk irregular in shape and hazy in outline.

The broad central belt of Jupiter was slightly reddish.

Saturn.

Saturn is increasing in apparent size. It rises on the 1st at 4h. 44m. A. M., and sets a little after 2 P. M. On the 31st it rises at about 10m. before 3 A. M., and sets a little after noon.

Uranus.

Uranus rises at 2h. 23m. P. M. on the 1st, and sets about 5 A. M. On the 31st it rises 20 minutes after noon, and

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sets about 3 A. M.

Neptune.

Neptune rises at 8h. 26m. A. M. on the 1st, and sets at 9h. 23m. P. M. On the 31st it rises at 6h. 30m. A. M., and sets at 7h. 30m. P. M.

Sun Spots.

About February 18, a long chain-like group of spots could be seen on the sun. Although some of them have already passed the center of the disk, the last of the group may be seen for some days.

SCIENTIFIC AND PRACTICAL INFORMATION.

IRON YELLOW AND IRON GREEN PIGMENTS.

It is desirable to have yellow and green pigments free from lead and arsenic, as both of these metals are the occasion of much mischief. An iron yellow, called *siderin yellow*, has been introduced to the trade: it is prepared by adding a saturated solution of bichromate of potash to neutral chloride of iron. A bright yellow precipitate forms, which, after thorough washing, proves to be a basic chromate of iron of a fixed chemical composition. This pigment, known as siderin yellow, can be used as a water color, also with drying oil, and, when combined with soluble glass, makes a fine yellow cement that sets rapidly and is insoluble in water.

If siderin yellow be mixed with ultramarine blue, fine green results, which can be also mixed with soluble glass, and could be substituted for the dangerous arsenic green in many arts. In the preparation of iron yellow, the following are the proportions to be taken: 433 parts of weight of crystallized chloride of iron, in which there are 325 parts anhydrous chloride, require for complete decomposition 1,473 parts bichromate of potash. After mixing and boiling the aqueous solutions of the above salts, 378 parts by weight of basic chromate of iron, siderin yellow, is precipitated. There remain in solution 1,049 parts chloro-chromate of potash and 389 parts yellow chromate of potash.

PROTECTING PETROLEUM FROM FIRE.

Charles A. Jordery of Paris has discovered that a small quantity of soap wort (*saponaria officinalis*) powder produces in combination with petroleum an emulsion of the consistency of lard or, rather, thick glue. This mixture flows with difficulty, and does not infiltrate into the fissures of leaky vessels. When ignited, it burns with a weak flame, easily extinguished and having no resemblance to the fierce deflagration of the light oils in their ordinary state. A small quantity of an aqueous extract of the powder is necessary, to which about thirty times its volume of petroleum is added little by little, and continually stirred. The result is very much the same as mixing salad dressing, the oil gradually thickening until a pasty mass is obtained. In this condition it is suggested that petroleum may be stored for any length of time or transported long distances with little danger from fire.

To regain the oil in its limpid condition it is only necessary to add a few drops of carbolic acid, or a somewhat larger quantity of crystallized acetic acid. The reaction takes place instantly, and in a very short time the petroleum appears pure and clear with all its properties intact floating above the soap wort extract. It is stated that the augmentation of the price of the oil through the use of this process would not exceed one quarter of a cent per quart.

This saponine process for giving to petroleum the consistency of thick gum was patented in the United States May 7, 1872, No. 126,552. The specimen we have seen resembles closely the paste employed by bill posters, and could be transported in ordinary wooden tubs, and would not be likely to take fire unless exposed to great heat; but the cost of treating petroleum on a large scale in this way would put the article on a par with sperm oil or paraffin. In fact, we should think that paraffin candles would be more economical than the patent oil. The whole thing is too much like combining butter with lime, to be subsequently set afloat by sulphuric acid after it reaches the city. Neither process is feasible on a large scale.

USES OF BISULPHIDE OF CARBON.

From a new work of Dr Rudolph Wagner, "*Die Chemische Fabrik-Industrie*," we extract the following: Until 1850. the only technical application of bisulphide of carbon consisted in vulcanizing and dissolving caoutchouc. Since that time, however, this substance has been applied to a good many purposes. 1. For the complete extraction of fat from bones for the preparation of bone black. Ten or twelve per cent of fat can be obtained. 2. For the extraction of oil from seeds and olives; large quantities of olive oil, rape oil, linseed oil, hempseed oil, palm oil, and cotton seed oil are obtained in this manner. 3. For the extraction of sulphur from sulphurous earth (according to Moussu) and of bitumen from bituminous rocks. 4. For separating fat from wool, woolen tissues, and rags from machine shops, by Seyferth's patent. 5. For the extraction of the soluble principles of spices, according to the process of Bonière of Rouen, France. 6. For the manufacture of yellow prussiate of potash according to Gélis, and of sulphocyanide of ammonium for the fabrication of the toys called Pharoah's serpents. 7. For the preparation of the Fenian or liquid fire, a solution of phosphorus in bisulphide of carbon, with which projectiles for rifled guns are filled. 8. In silver plating a small quantity of bisulphide of carbon is added to the silver bath, so that a brilliant deposit may at once be effected. 9. For killing rats, mice, moths, ground worms, and other vermin. 10. As a motor for steam engines; all systems of steam engines, with or without expansion, can be run with bisulphide of carbon, which, as well known, boils at 115° Fah. The construction requires no essential alteration, but, since bisulphide of carbon dissolves fat and oil with ease, water must be used for lubricating.

ENAMELING PUMP CYLINDERS.

Cast iron cylinders can be enameled in the following manner, according to Amtmann: To separate the graphite, they are laid for two or three hours in an acid bath, and then well washed off with water and brushes. A mass, consisting of 34 parts quartz, 15 parts borax, and 2 parts carbonate of soda is then uniformly spread on; the pipes are then heated for ten minutes in a muffle of a semicircular cross section of the width of 36 inches, and 9 feet in length. They are then withdrawn, cooled, and coated uniformly with a glazing composition consisting of 34 parts felspar, 19 parts quartz, 24 parts borax, 16 parts oxide of tin, 4 parts fluor spar, 9 parts carbonate of soda, and 3 parts niter. The mass is prepared by melting the materials together in a crucible and then grinding them in a mill, with the addition of water. After the cylinders have been covered with the glazing, they are heated in a muffle to a white heat for twenty minutes, whereupon they are withdrawn and coated with coal tar before they are quite cold. In practice, they have been subjected to a pressure, and showed no cracks, proving that the combination of the materials was thorough and complete. Attempts to glaze lead pipes have hitherto been unsuccessful.

CAUSTIC SODA.

An important improvement has been effected in the manufacture of caustic soda by the introduction of a blast of air through the melted mass. The caustic soda, as prepared from from soda ash by means of lime, is contaminated with carbonate of soda, cyanides, and sulphur compounds; the latter are particularly deleterious in numerous operations, and much attention has been bestowed upon getting rid of them. Formerly some saltpeter was added to the lye and the sulphide of sodium was oxidized to Glauber salts, which was less objectionable, but the process is expensive and the result not satisfactory. W. Hebig, of Gera, Germany, has modified the operation by blowing air through the fused soda, by which the sulphides are oxidized and the cyanides decomposed. The operation is conducted as follows: The soda lye is evaporated in iron kettles, and a point is reached at which the cyanogen and ammonia compounds are decomposed and graphite swims on the top. Finally the contents of the kettle are heated to redness and melted to a thin liquid; while in this condition, a current of air is passed through. Graphite floats on the top which is sometimes saved but, owing to its crystalline texture, is not adapted to paint or pencils and is often burned up as useless. The air blast is made so strong as to keep the mass in agitation, and is continued until all of the sulphur is oxidized. The operation is then suspended, the air tube is removed, and the soda poured off the sediment and allowed to solidify. A good product is secured in this way more cheaply than by the saltpeter process. The graphite obtained as an incidental product is quite large in some establishments, and is made up into refractory crucibles.

A GOOD OIL TEST.

Inquiries have been made for a good oil test, and all sorts of nostrums of the "magic," "lightning," and other brands are to be found in the market. It is not easy to find a simple test that will prove decisive on all occasions, but an approximation can easily be made. A convenient test to those about a factory or workshop is the nitrate of mercury. To prepare this reagent, dissolve metallic mercury in an excess of nitric acid; after all the mercury is dissolved, evaporate the liquid over a water bath to sirupy consistence and add a little nitric acid, and store in a glass stoppered bottle. The nitrate of mercury must not be permitted to come in contact with the skin or clothes, as it will stain and destroy both. Pure standard samples of oil should be kept on hand for making comparative tests. Take one part of the nitrate of mercury and three parts of oil and pour them into a test tube; protect the thumb with a piece of india rubber, and shake well and notice the appearance of a specimen of pure oil as compared with a sample suspected to contain impurities. We can in this way soon learn by experience how to detect a poor article. After making the observation with the nitrate of mercury alone, add a few drops of oil of vitriol and note the changes. Some persons use watch glasses, into which they put 10 or 15 drops of oil, and test with bisulphide of carbon, oil of vitriol, chloride of zinc, and chloride of tin. The oil test usually sold under a variety of names is the nitrate of mercury prepared as above.

POISONING OF A HORSE BY THE PAINT ON A CRIB.

According to a communication of Professor Bollinger, of Zurich, Switzerland, a hitherto healthy Wallachian horse, of five years age, was subjected to veterinary treatment on account of a slight nasal catarrh. To effect a cure he was fed with boiled barley, which was given him in a painted cast-iron crib. Soon, however, he lost his appetite, became very feverish, and got a violent diarrhœa, which, in spite of all the medicines administered, could not be alleviated; and he died nine days after the feeding in said crib. A post mortem examination showed small discharges of blood into the lungs, a considerable swelling and fatty degeneration of the liver, and catarrhal inflammation of the intestines. No abscesses, however, were found in the latter. In general, the dissection gave the impression that the animal had died from either phosphorus, arsenic or lead. Accordingly a chemical examination of the milt, the liver, and of the contents of stomach and bowels was undertaken, in all of which small quantities of lead were discovered. The oil paint, moreover, yielded sulphate of lead and chromate of lead in abundance. It was of a blackish green color, and adhered to the iron in a loose, lamellar condition. There was no sure indication of arsenic, antimony, zinc or barytes. From the results of the examination, there is no doubt that the animal, being fed with the boiled barley, had taken large quantities of the lead in the oil paint of the crib.

REGENERATION OF BONE BLACK OF SUGAR REFINERIES.

Eisfeldt and Thumb have introduced for this purpose exhaustion with ammonia, in place of the heating process hitherto employed. The animal carbon or bone black is first subjected to fermentation or boiling with soda; and, after being washed, it is placed in an iron cylinder with a perforated bottom, and boiled therein, with ammonia of two per cent, by the introduction of steam. This operation is repeated thrice, each time for an hour, until a sample of the lye, on being evaporated and heated with soda lye, yields no color. The ammoniacal vapors are condensed in the cooling worms and re-conveyed into the treating cylinder. This process is said to cost one third less than the ordinary one. The ammonia dissolves not only the organic substances, but also the gypsum and caustic lime, so that there will be much less muriatic acid required to keep the amount of lime constant. The waste of the carbon is greatly decreased, and much which otherwise would be consumed by combustion is saved.

The Resources of Richmond, Va.

A correspondent, A. S., says that Richmond, whose name, but a few years since, was on every tongue, being made famous by the active part she took in the late bloody struggle, is now an example worthy to be followed by any sister city, and more especially by those who stood by her in days of yore. Here swords have been turned into plowshares, and scarcely had the cannon ceased its deadly firing when the hammer and anvil struck their sweeter notes, and have made Richmond what she is, and have placed her where she is, with but few visible traces of the war.

This grand old city, capital of the State which has produced intellect, unsurpassed in the world, to represent her in Congress and elsewhere, when brains, honesty and virtue were the noblest traits of man, stands, as Rome does, on seven hills; but unlike Rome's ragged crags, her hills are beautiful terrene waves whose slopes are just adequate to afford the most perfect drainage, as the least fall of water cleanses her streets as a swept floor. Her climate is always comparatively mild, and she is noted for her salubrious situation, and many spend much time here seeking the greatest earthly boon, health.

The picturesque river James, whose current rushes madly over the rapids above, along half the length of Richmond, here settles into deep water, affording unlimited and unequalled water power, with a clear course to the sea for the largest vessels. Indeed, Nature seems to have spent some time in nestling here all the requisites for a manufacturing and shipping town, and to-day Richmond presents to the capitalist and mechanic inducements scarcely to be found elsewhere. Already have her manufacturers won for themselves high praise as to the quality and quantity of their wares. And while much capability lies dormant, the day is not far distant when she will laugh at the rivalry of her sister cities. The blaze of the furnace and the clash of the miner's pick are now seen and heard in her great storehouse, the valley of Virginia, where lie inexhaustible supplies of economic minerals: that is to say, of minerals in common use in the mechanic arts. And on January 30, 1873, the Chesapeake and Ohio railroad trains made the first through passage to the Ohio, and will in future transport to Richmond the heretofore untouched supplies of gold from the belt of Louisa, the roofing slates of Albemarle, the kaolin of Augusta, hydraulic cement and marble from Rockbridge, besides iron, limestone, coal of all kinds, granite, marl, copper, fire clay, salt and products of the soil lying along three hundred miles of this road.

Indeed, a new era has just opened upon Richmond. Labor is cheap and plentiful, but capital she much needs, as her merchants, reduced by the war, cannot enter much into the new undertakings which should and will soon adorn her. But let capitalists consider her offers and invest here, where eventually the continent will look for many of its supplies.

Philadelphia Academy of Natural Sciences.

The Academy now possesses more than 6,000 minerals, 700 rocks, 65,000 fossils, 70,000 species of plants, 1,000 species of zoophytes, 2,000 species of crustaceans, 500 species of myriapods and arachnidians, 25,000 species of insects, 20,000 species of shell-bearing molluscs, 2,000 species of fishes, 800 species of reptiles, 21,000 birds, with the nests of 200 and the eggs of 1,500 species, 1,000 mammals, and nearly 900 skeletons and pieces of osteology. Most of the species are presented by four or five specimens, so that, including the archæological and ethnological cabinets, space is required now for the arrangement of not less than 400,000 objects, as well as for the accommodation of a library of more than 22,500 volumes. A new building to cost half a million is now in process of erection.

ASSAYING LEAD ORES.—Previous to reducing the galena or other lead ore to the metallic state, A. Mascazzini converts the lead present in the ore into sulphate, by igniting it in a porcelain crucible with sulphate of ammonia, after which the ore is treated in the usual manner. The flux preferred by the author is that recommended by Plattner, consisting of 13 parts of carbonate of potassa; 10 of dry carbonate of soda; 5 of previously fused borax; and five of well dried starch.

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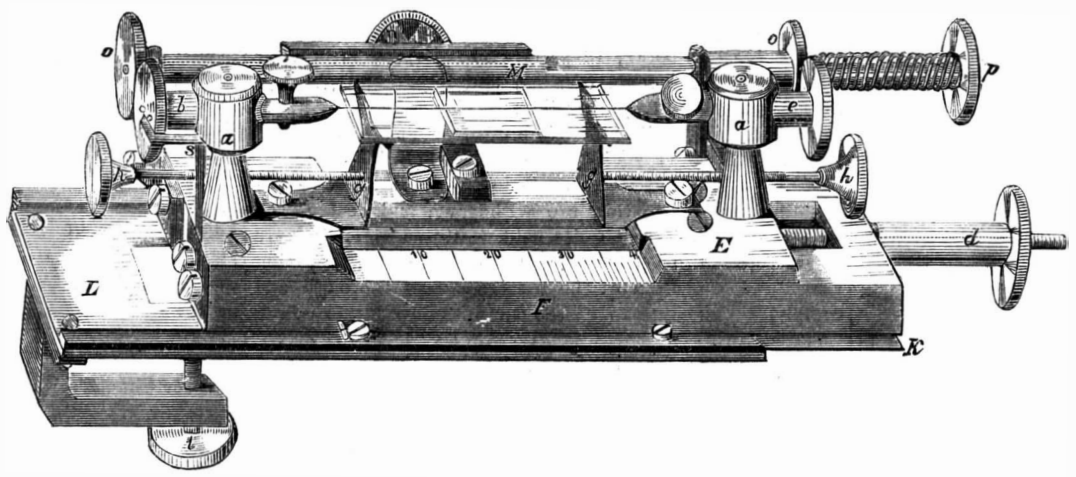
INSTRUMENT FOR MEASURING FIBERS.

J. Bohm communicates to the *Industrie Blätter* particulars of an instrument invented by him for measuring the diameters of fibers of wool, silk, and substances of a similar nature. The method of cutting across the fiber cannot be relied on, as it is almost impossible to make the cut perfectly vertical, and the slightest deviation towards obliquity will give an erroneous result. A better mode is to stretch the fiber to get rid of the kinks, and to turn it on its axis, as it were, under a microscope, so that the variations in its diameter may be distinctly observed, and measured with the micrometer; its whole length, also, should be passed under the object glass. For this purpose, an ingenious little instrument has been constructed by Mr. Bohm, of which we give an illustration. The inventor states that it not only has answered all the purposes for which he designed it, but has been useful in ways that he did not expect. It was found, for instance, that a hair ordinarily appeared to be unequally thick in various parts of its length; this was owing to the long and short diameters of its oval section coming alternately under the vision, and the cause of the appearance was at once revealed by the instrument. And, again, the uniform decrease in the diameter of a hair towards its point, and the irregularity and inequality of fibers of wool from sick sheep, have been rendered visible. It has been found, too, that swellings and knots in otherwise straight fibers are produced by overstretching in the instrument, and the value of the arrangement for untwisting the fibers was here shown, for the knots began to uncurl the moment one end of the fiber was turned.

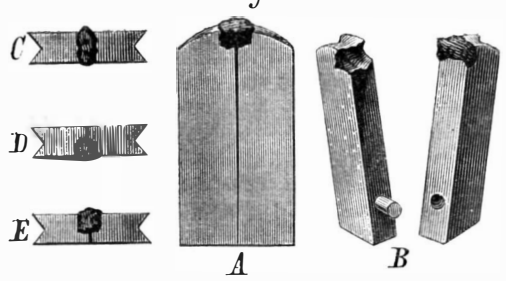


INSTRUMENT FOR MEASURING FIBERS.

In the engraving, *a a* are two columns, provided with the tweezers, *b* and *c*, which can be turned independently of each other. The object to be examined is fastened into these tweezers. It is evident that the hair must be attached exactly to the points, for otherwise, by turning both tweezers uniformly, an eccentric rotation of the fiber would be the result. The manipulation is facilitated by gumming each end of the object between two pieces of stiff paper, which can be easily adjusted between the two jaws, by sliding to and fro until the fiber is exactly in the center. This being the case, the hair is stretched by turning the screw, *d*. On the support, F, there is a scale, by which the degree of tension over the whole length is indicated. When stretched, a glass plate, carried by *g g*, is laid under it. It is necessary that the object to be examined lie flat on the glass, and that it is not strained over its ends, which would be the case if the points of the tweezers were lower than the upper surface of the object-supporting glass. To this end, the two adjusting screws, *h h*, are provided, which press the steel support, *g g*, downwards or upwards, as desired. The object being adjusted, it is immersed in glycerin, and covered from the air. The instrument is now placed under the microscope by fastening it on the table thereof. The screw, *i*, must previously be turned down, sufficiently to be conveniently slid under the stage of the microscope; and if the instrument is properly placed under the field of view, it is screwed on. The object is first examined with a low magnifying power (if not perfectly stretched, this may be done now); then the untwisting may be proceeded with by turning the tweezers in opposite directions. In order that the object may be viewed in its whole length, the instrument is made to slide to and fro; it rests with its sliding bed, K K, on bed, L. By turning the screw head, *d*, towards the left, the whole instrument follows in that direction, and *vice versâ*. If it is seen, on examining the object in its whole length, that the fiber is straight, rod, M, is engaged, by carefully turning the screw, *n*, until the two driving disks, *o o*, are in gear with the heads, *b c*, of the tweezers. This being the case, the latter may be turned uniformly around on their common axis, and the object may be thus examined on all sides. The head, *b*, of the left tweezer is divided on its outer surface into six equal parts; the pointer, *s*, works them.

The instrument described is adapted not only for wool, but for other animal or vegetable fibers; and in many manufacturing operations, such an implement will be found useful. The adjustability of all its parts in every direction will particularly recommend it to experts and investigators, and, as our engraving shows, it is a very neat and elegant tool, made with all the finish necessary to insure accurate working and to facilitate minute observation.

Fig. 3

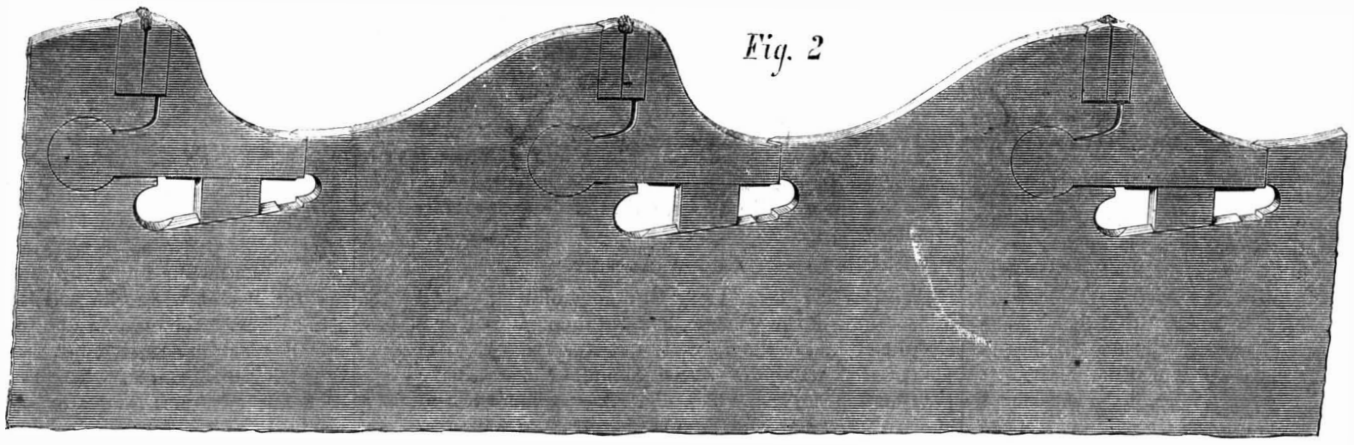


EMERSON'S DIAMOND STONE SAW.

The use of diamonds or carbons for the drilling and dressing of stone has suggested their employment for sawing the same material. It is for the latter purpose that the invention herewith illustrated is designed.

Fig. 1

Fig. 2



EMERSON'S DIAMOND STONE SAW.

Our engravings afford a very clear idea of the device, rendering detailed explanation unnecessary. Fig. 1 gives an edge view of a saw in its full size. Fig. 2 is a section in perspective. Fig. 3 represents the diamond holder, of which A exhibits the appearance of a side, B a perspective view, and C D and E the different shapes of diamonds used. The solid steel holders are made adjustable and interchangeable in the saw. It is claimed that, in griping the diamond, they hold its jagged shape imbedded with such firmness that the cast steel will be torn asunder before the carbon will work loose. The mode of confining the holders, it is also asserted, does not in any way tend to chain or buckle the blade or affect its proper working.

The device is equally applicable to circular and reciprocating saws, and is, without doubt, an important and valuable improvement. It is now owned by Messrs. Emerson, Ford & Co., of Beaver Falls, Pa., from whom further information may be obtained, and was patented April 25, 1871, by Mr. J. E. Emerson, the inventor of inserted-tooth saws for lumber.

TOOTHACHE.—A new remedy consists in the employment of injections introduced into the gum near the diseased tooth. Dr. Dop has tried these injections in about one hundred cases. In twenty cases he made use of morphia, which succeeded very well, but only for a time. Chloroform was far more successful, and is now exclusively used by Dr. Dop. It was eminently successful in 62 cases out of eighty. The injection is made with the small syringe commonly used in France for subcutaneous injections. Only two drops are put in at a time. The needle is introduced gradually, and must remain *in situ* a few seconds. On withdrawing it, pressure must be exerted on the gum with the finger. In by far the greater number of cases, one injection is quite enough to stop the toothache.

Preparation of Light Drying Varnish.

Twenty-five pounds of pure linseed oil are poured into an enameled iron pot, which holds about forty pounds weight; the pot is then placed on a moderately strong charcoal fire, and the linseed oil heated for about half an hour to the boiling point. In the meantime four ounces of pure oxide of manganese are to be rubbed down in linseed oil. This mass is then put into a small vessel provided with a spout, and poured in drops into the boiling linseed oil, while being gently stirred with a wooden spatula.

During the rising and effervescence of the heated oil, the dropping in of the manganese preparation must stop.

As soon as the oil has settled the dropping in is continued to the last. The vessel is washed out with linseed oil, which is poured into the boiling oil. The varnish is now boiled slowly for an hour, but if a stronger or more quickly-drying varnish is desired, it should be boiled for half an hour or an hour longer.

The finished varnish is then removed from the fire, covered with a clean plate, and left to rest for about twenty-four hours, then carefully poured off into clean vessels. The sediment and other residue are generally used for ordinary ground colors.

The pure linseed oil varnish poured into glass bottles can be perfectly bleached by selecting a suitable spot where the sunlight and moonlight penetrate. According to Dr. Gromann, moonlight bleaches quicker than sunlight. The clear bleached linseed oil varnish is used only for the finest white oil and lac colors, and for dissolving the copal lacs, as well as a drying medium for all fine oil colors.

NEW METHOD OF ATTACHING HANDLES TO SAWS.

Mr. James E. Emerson, of Beaver Falls, Pa., has recently devised an ingenious means of attaching saws in their handles, an engraving of which we herewith present.

The invention consists in an irregularly shaped cam bolt, the body of which is a little longer from the shoulders than the combined thickness of the wings attached to the handle socket and the saw blade inserted between them, in order that the clamping cam may have a hold upon the outside of one of said wings. This projection increases in thickness from the end. As the bolt is turned in one direction, it forces that wing of the socket toward the shoulder of the thumb bolt and clamps the saw blade firmly between the wings. At the same time the enlarged diameter of the body, in turning, is hard against the side of the hole through the saw blade, forcing the latter endwise against the rivets. By this means a solid end bearing for the blade is obtained. The bolt can enter the orifices in the wings and saw blade in but one way, so that no mistake can be made by not placing it in its proper position.

Fig. 2

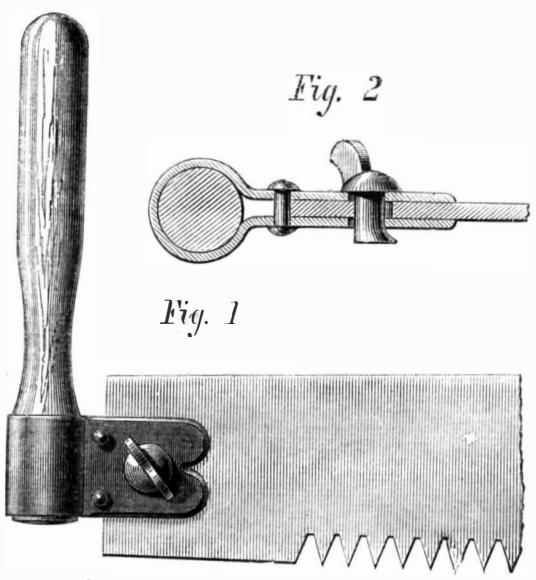


Fig. 1

Mr. Emerson is also the inventor of the diamond stone saw illustrated and described on this page, as well as of many other improvements in saws and sawing machinery. For further particulars address Emerson, Ford & Co., Beaver Falls, Pa.

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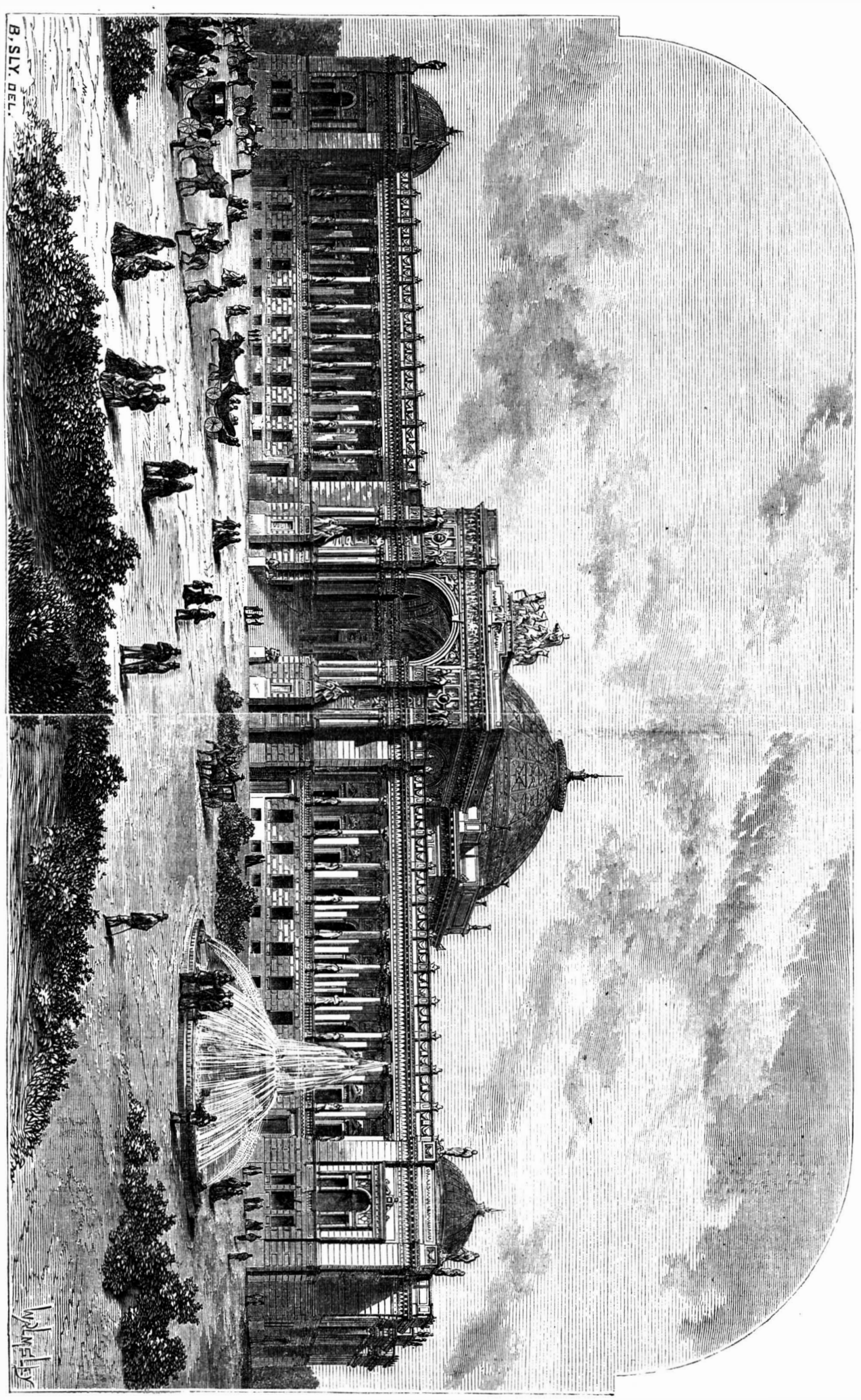
THE NEW PARLIAMENT HOUSE IN BERLIN.

Our illustration represents the proposed Parliament House in Berlin, the design of which is the work of Mr. L. Bohnstedt, of Gotha, and was selected from the plans of a large number of competitors. The building is intended to be of a monumental character, and will be richly provided, outside and intside, with sculptures and paintings. It is divided into two parts, the substructure (the basement and ground floor being treated as one mass) and the main story. The latter will contain the chamber offices of the high government officials, the official residence of the President of the Parliament, together with the necessary committee rooms, halls, etc. The chamber, by the large surface it occupies, its hight and dome, is characterized, even in the exterior, as top and chief part of the whole edifice. The two main courtyards within are connected with elaborate gateways with the adjacent streets. All the rooms are covered with vaults between iron girders.

The rich sculpture work on the exterior of the structure required simplicity in the architectural work and its groups. The main entrance, leading up to the principal story, is the prominent part of the west front, formed like a triumphal arch, and crowned with a bronze group of figures representing Germany, the North and the South guiding the steeds of her victory car. Sculptures on both sides of the central entrance bring to mind the deeds of 1812, 1815, and 1870 and 1871. The inside of the hall is decorated with large semicircular fresco pictures. The open balcony or colonnade is provided with historical bas-reliefs, and on the balustrade in front of the columns with statues of worthy men. The parapet is intended to show the arms of the chief places or provinces, executed in colored mosaics. Brass plates with inscriptions are enlaced in the walls.

Corresponding to the exterior, the architecture of the interior is treated so as to allow a rich decoration, principally with pictures. The walls of the chamber above the floor of the galleries show panels in dark colored marbles and projecting pillars bearing large marble statues representing the German provinces. The vaults there are decorated with colored ornaments on a gold ground. The chamber is lighted by a rich skylight, the upper part of its dome being constructed of metal and glass.



THE PROPOSED PARLIAMENT HOUSE IN BERLIN, GERMANY.

The design, as a whole, is of great architectural beauty, and the false theatrical effect generally gained in such buildings, by erecting unsuitably high towers or vast useless domes, is notably absent.

How to Clean Greasy Vessels.

At a recent meeting of the Lyceum of Natural History, Dr. Walz suggested a method for cleaning greasy beakers and photographic glass plates, which must at once commend itself to all practical chemists and photographic operators. He takes a dilute solution of permanganate of potash (kept on hand in a large stock bottle), to which a few drops of hydrochloric acid are added when used; and he pours in enough to wet the sides of the vessel to be cleaned. The greasy impurities are at once oxidized and removed. The method is preferable to the employment of bichromate of potash and sulphuric acid. The permanganate of potash solution can be saved and used repeatedly until, by the exhaustion of its oxidizing power, it ceases to act.

Incendiary Rats.

Not long ago a four story brick building, occupied by a dealer in teas and coffees, in Vesey street, New York, was found to be on fire. The fire was discovered shortly after midnight on Sunday night, and originated between the ceiling of the first floor and the flooring above. The space above the fire, on second floor, was covered with a large quantity of coffee in bags; upon removing this, and cutting away the floor, it was found that rats had made a nest upon the girder, using oily waste dragged from the engine room in the basement, and this had ignited spontaneously. Had this evidence been destroyed, it would have been an impossibility to arrive at any positive conclusion regarding the origin of the fire. The stock was large and the insurance very heavy, and, had the fire proved disastrous and the origin been unexplained, suspicion might have been cast by the uncharitable upon some person connected with the establishment.

A Good Year for Iron Workers.

The direct connection between the use of iron and the advances of civilization gives a general interest to a review the iron industry at the present prosperous time. High prices having ruled at home and abroad, the production of iron in this country has been greatly stimulated the past year. Since the war and the change in the relations of labor in the Southern States, the tendency in that section to the development of varied industrial resources has added largely to the iron-producing area. The chief difficulty has always been in respect to the means of transportation; and the growth of our railroad system, greater last year than ever before, has been more than ever directed toward internal improvement—to speak specifically, toward developing coal and iron industries. This was true last year of many States, but chiefly of Virginia, Alabama, Missouri, Indiana, and Michigan, if the proportion of new railroads to those previously existing be made the basis of estimate. But many of these new enterprises are scarcely yet completed, and the production of last year affords but little indication of the work that has been actually begun. We may expect, for various reasons, a great increase in the production of iron during the present year. The demand for it has very largely increased. It never was so largely used as now for architectural purposes, and the recent experience of the danger of great fires will increase its use in place of wood. The public is even inclined to the belief that iron fronts are safer against fire than stone; the fact being that safety depends less upon material than on construction. It will give an idea of the extent to which specialties in industries are carried to mention that there is near this city a large manufacturing establishment which confines itself to making the iron work of gas houses The demand for rails increases with the increasing growth of railroads. There are also many circumstances to occasion a large supply of iron, aside from the stimulus of high prices. We have many inventions to dispense with costly labor. The method in use by our rolling mills turns out one third more rails to a set of rolls than that employed abroad. The Danks puddling machine, which has just gone into use, is destined to dispense with the services of the puddler, and very greatly hastens as well as cheapens the operations that produce wrought iron. The discovery of coal that can be used without preliminary conversion into coke provides another means of saving time and labor. Great improvements have also been made in the American process for manufacturing Bessemer steel, so that the works already existing turn out considerably more rails than formerly, and several new works of great capacity are projected or have come recently into operation. The iron makers reasonably anticipate a busy and prosperous year.—*New York Tribune.*

U. GAYOU comes to the conclusion that the main cause of the decomposition of eggs is the presence of small organisms which must have formed in the eggs while in the oviducts of the fowl.

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Grindstones not Extinct.

Some persons may be impressed with the idea that the turning lathe and modern emery wheel have entirely superseded the grindstone; but it appears from a statement from J. O. Mitchell, an extensive grindstone dealer in Philadelphia, that such is not the fact. He says that, at the Baldwin works, no less than 6 grindstones, of 2 tuns weight each, are kept constantly running on locomotive work; not only are all the rough castings ground, but 41 of the working parts of an engine are finished in this way. Grindstones are also used for finishing pulleys, which are caused to revolve against the stone, running rapidly in an opposite direction; this grinds down the face of the pulley very fast and perfectly true, and at less cost than turning in a lathe.

PROFESSOR AGASSIZ defends his rejection of the Darwinian theory of evolution on the ground that "his opponents are presenting views on scientific principles which are not even based on real observation; that they have not shown evolution, or the power of evolution, in the present day, and hence are not entitled to assume it in the past." He further characterizes the theory as a "mire of mere assertion."

PRESERVATION BY COLD.—Professor Boussingault states that a quantity of beef tea, having been submitted some eight years ago to a temperature of —20° for several hours, has remained in perfectly good condition up to the present time. Sugar cane juice was at the same time subjected to this treatment, and was found to be in excellent condition. Both substances had of course been kept in closed vessels.

PATENT OFFICE DECISIONS.

TRADE MARKS.—C. E. RICHARDSON ET AL.—APPEAL.

LEGGETT, *Commissioner:*

Applicant petitions for the registration of the words "A. Richardson's Patent Union Leather Splitting machine." It appears that the leather splitting machine he proposes to manufacture and place this alleged trade mark upon has been patented, manufactured, and put upon the market under the above caption during the past twenty years, and that the patent has expired. The Examiner has therefore held that the word "Patent" cannot properly be sanctioned as part of this trade mark, because it would tend to deceive the public and perhaps induce a violation of section 39 of the Patent Act. Applicant then proposes to drop this word, and asks that the words "A. Richardson's Union Leather Splitting Machine" be registered, if, in the opinion of the Commissioner, the words as originally submitted must be rejected. This does not relieve the case of another objection. The words presented have become the generic name of these machines by which the public now know them. They have been before the country under this caption as patent devices. The right to make them has now fallen into the hands of the public, and why should not the public have the right to use the name by which they are known and which they have acquired by virtue of the patent? When a device becomes public property its name must also. If the word "Union" were now adopted for the first time, it would no doubt in this connection render the words presented registrable. But it has become a part of the name of the device to which it is proposed to be applied, and therefore registration must be refused.

TRADE MARK.—STERNBERGER VS. THALHEIMER & HIRSCH.—INTERFERENCE.—ADMISSIBILITY OF EVIDENCE.

Parties who employ a word in an experimental way in five or six instances, and take no further steps with it for three months, do not thereby gain a title to it as a trade mark as against one who has in the meanwhile adopted it and put it into general use.

Neither will the latter lose his right to it because the others procure it to be registered.

Upon an interference between an application for the registry of a trade mark and a trademark already registered, evidence was adduced tending to show that the applicant had admitted in conversation that he had not previously made use of the trade mark: Held, that it was competent for him to prove, although upon the rebuttal, that he had been in the use of it prior to the conversation.

THACHER, *Acting Commissioner:*

The decision of the Examiner of Trade Marks is affirmed, and the right to a certificate of registration awarded to Sternberger.

DECISIONS OF THE COURTS.

United States Circuit Court---District of Massachusetts.

TAN BARK EXTRACTS.—PINGEE'S PATENT OF OCTOBER 26TH, 1865.—ABEL E. BRIDGE ET AL. VS. RUFUS H. BROWN ET AL.—INFRINGEMENT.

[In Equity.—Before Shepley, Judge.—October Term, 1872.]

A patent for an apparatus for making extracts from tan bark by means of exhaust steam, which claims in combination an exhaust steam pipe, a leach and intermediate boxes in which the steam is condensed, and also expands so as to avoid back pressure on the piston, is not infringed by a similar apparatus in which there is no exhaust pipe nor provision for avoiding back pressure, but the steam is taken directly from the boiler.

SHEPLEY, *J.:*

The patent is for an apparatus for making extracts from tan bark and other material not for the process of extracting the tannin, but for an apparatus consisting (first) of the boxes with perforated sides, applied in combination with (second) the exhaust pipe and (third) leach or its equivalent, (fourth) in the manner and (fifth) for the purpose substantially as set forth.

In the state of the art at the date of the invention of Pingree, there was nothing new in the form or structure of his leach, nor in the mode or purpose of its use, apart from the introduction into it of steam from the exhaust pipe of an engine instead of from a steam pipe taking its supply directly from a boiler. The boxes with perforated sides are not claimed except as combined with the exhaust pipe and leach, in the manner set forth in the patent, and for the purpose set forth. This purpose was the utilization of exhaust steam and the consequent saving of fuel in making extracts from tan bark and other materials. There is no evidence in this case that the defendants use the complainants' combination. They do not use the boxes in combination with the exhaust pipe in the manner or for the purpose set out in the patent, that manner and purpose being in the patented apparatus that the exhaust pipe should conduct the exhaust steam to the leach in such manner that the steam is free to expand, and made to condense partially as it passes from the exhaust pipe into said box, and all back pressure on the piston is avoided, and at the same time the full benefit or the action of the steam on the bark is obtained. Respondents do not use their boxes to conduct exhaust steam to the leach, nor for the purpose of condensing the steam and avoiding back pressure on the piston. They do not use exhaust steam, but take their steam directly from the boiler. They do not use their boxes in combination with complainants' exhaust pipe, for they do not use any exhaust pipe or any equivalent for it. The pipe used by them is not like the exhaust pipe of a steam engine, and is not capable of being used for that purpose. The dimensions of the pipe are such as would effectually prevent its use for any such purpose, in connection with the process for which it is used by the respondents. It is contended by complainants that, although the apparatus patented by Pingree is designed for exhaust steam, their patent would cover its use for any cognate purpose. It is a sufficient answer to this position that it has already been shown that respondents do not use all the elements of their combination as described and claimed in their patent. Respondents' steam pipe is not the exhaust pipe or the equivalent of the pipe described in Pingree's claim. No case of infringement is made out, and complainants' bill must be dismissed.

T. L. Wakefield, for complainants.
Ives & Lincoln and *G. L. Roberts*, for defendants.

STONE BREAKING MACHINES.—ELI W. BLAKE ET AL. VS. GEORGE W. RAWSON

SHEPLEY, *J.:*

This bill in equity is brought for an alleged infringement of the reissued patent of January 9, 1866, to Eli W. Blake, for a new and useful machine for breaking stones for road and other purposes.

The principal points relied upon in the present case, by the learned and able counsel for the respondents, are those which are also set up in the answer in relation to the alleged prior inventions of James Hamilton, as described in letters patent of the United States issued to him on the 3d of January, A. D. 1854, for "Improvements in machinery for crushing and grinding quartz and other hard substances," and also of one Samuel Forward (or Forwood) of Louisville, Kentucky, who constructed a machine for breaking stones for roads in Louisville, in the year 1847.

The essential characteristics of Blake's stone crusher are two jaws between which the stones are to be broken, having their acting faces so nearly in an upright position that stones to be broken will descend by force of gravity between them, and convergent downward one toward the other in such manner that, while the space between them at the top is such as to receive the stones to be broken, the space at the bottom is only sufficient to allow the fragments to pass when broken to the required size.

Although he describes a crank, lever, and toggle-joint as one mode, and the mode adopted by him, of communicating a definite motion to the movable jaw from the revolving shaft, no construction can properly be given to the patent, such as is suggested by respondents, which would limit it to the toggle-joint mechanism, which is described by the patentee as the particular form in which one element of the patented combination is constructed and embodied in one form of his machine. The machine patented frequently has a broader scope than the particular *form* of the machine described as the form *used* by the patentee. The question of novelty is to be settled by a comparison of prior machines with the machine patented rather than the form of the machine in use.

The Hamilton quartz crusher, relied upon as an invention antedating the complainants', is a combination of certain elements which, separately considered, do not materially differ from the elements of the combination described in the Blake patent. All the elements of the combination are old in both machines. The novelty in both consisted in the peculiar mechanical combination of the members of the contrivance and the resultant mode of operation.

A careful examination of the evidence in the case, and close comparison of the working models of the two machines, has resulted in forcing upon my mind the same conclusion arrived at by Mr. Justice Nelson, in the case of *Blake* vs. *Stafford*, when he says: "Hamilton's quartz crusher neither embodies the arrangement nor mode of operation of the plaintiff's machine, but operates upon a different principle and embodying a different set of ideas."

The Forwood machine is not in existence, and no such machine is proved to have been in existence within twenty years. There is no evidence tending to show that more than one Forwood machine was ever made or used. Only two persons testify to having seen that machine. Only one witness testifies to anything which can possibly be claimed to have been any other than an experimental use.

It is difficult to see how Blake could have been aided in the development of the ideas embodied in his structure by any suggestions he could possibly have received from Forwood's machine, if that had been in existence and known to Blake when he was developing his invention.

The infringement by the Rawson machine is obvious.

Decree for complainants.

H. T. Blake, G. W. Baldwin, for complainants.
Shennan & Drew, for defendant.

United States Circuit Court---District of Maine.

COPYRIGHT IN TITLE.—TRADE MARK AND INVASION THEREOF.—JAMES R. OSGOOD ET AL. VS. EDWARD C. ALLEN.

[In Equity.—Before Shepley, Circuit Judge.—Decided December, 1872.]

A title separate from the publication which it is used to designate is not protected by the copyright law. It is only as a part of the copyrighted book and as the title to that particular literary composition, that the title is within the provisions of the copyright act.

The office of a trade mark is to point distinctively to the origin or ownership of the article to which it is affixed.

Generic names and those merely descriptive of an article or of its qualities or ingredients, and geographical names which point out only the place of production and not the producer, are not the subject of trade mark.

In all cases of invasion of rights to the exclusive use of a trade mark, the essence of the wrong consists in the sale of the goods of one manufacturer or vender as those of another.

A suit in equity brought by the complainants, proprietors and publishers, at Boston, Massachusetts, of an illustrated copyrighted monthly magazine, entitled "Our Young Folks, an Illustrated Magazine for Boys and Girls," against the defendant, publisher at Augusta, Maine, of a semi-monthly paper, also copyrighted, entitled "Our Young Folks' Illustrated Paper." The two publications were in no respect similar, excepting in the use in the title of each of the words, "Our Young Folks."

Upon bill, founded upon alleged copyright and trade mark right in the words "Our Young Folks," filed to restrain the defendant from continuing the publication of his paper: Held, 1. That the complainants had no copyright in the words "Our Young Folks" separate from the copyrighted magazine. 2. That the cause should be referred to a master to ascertain whether the public had been deceived, or was in danger of being deceived, into the belief that the respondents' publication was, in fact, that of the complainants', and thereby led to purchase the same.

R. M. Morse, Jr., and *R. Stone, Jr., Butler & Fessenden*, of Portland, for plaintiffs.
Causten Browne and *J. S. Holmes, A. R. Strout*, of Portland, for defendants.

NEW BOOKS AND PUBLICATIONS.

MYSTERIES OF THE VOICE AND THE EAR. By Professor O. N. Rood, of Columbia College, N. Y. C. C. Chatfield & Co., 460 Chapel Street, New Haven, Conn.

A neatly gotten up edition of Professor Rood's excellent lecture. The pamphlet forms No. 10 of the well known "University Series" which the above named publishers have been issuing for some time past.

THE PRACTICAL MAGAZINE; an Illustrated Cyclopædia of Industrial News, Inventions, etc. London. James R. Osgood & Co., Agents, Boston, Mass. Monthly. $1 per copy; $10 per annum.

We have before referred to this mammoth English monthly, and have given our readers a general idea of the abundant supply of useful, valuable, and interesting matter with which its pages are replete. The printing is far above the level of our ordinary industrial monthlies, and the illustrations, several of which are selected from our own columns, are of uniform excellence throughout. We welcome the new comer in the field of industrial journalism, and cordially wish for it every success.

We are in receipt of the February number of the PEOPLE'S MONTHLY of Pittsburgh, printed in new type, and on tinted paper. It has no less than eight engravings, some of them being very beautiful. The two famed poems, the "Wonderful One Horse Shay" (O. W. Holmes) and the "Barefoot Boy" (Whittier), are both illustrated in this attractive number. The "People's Monthly" is a pure, wholesome, and attractive *home* paper, and well deserves a generous western support. Charles McKnight, publisher, 84 Fifth Avenue, Pittsburgh, Pa. Price $1.50 a year.

PROCEEDINGS OF THE AMERICAN PHARMACEUTICAL ASSOCIATION at the Twentieth Annual Meeting, held in Cleveland, Ohio, September, 1872. Philadelphia: Sherman & Co.

This volume is of interest and importance to the pharmaceutical profession, and many of the papers contained therein are of permanent value, containing much information.

THE CHICAGO RAILWAY REVIEW makes its appearance in quarto form, with new and elegant typography. It is a valuable journal, ably edited and always interesting.

GEORGE P. ROWELL & Co.'s GAZETTEER, containing a Statement of the Industries, Characteristics, Population, and Location of All Towns in the United States and British America, in which Newspapers are published.

This well compiled work will be useful to all who want to advertise (and who does not ?), and trustworthy information as to different localities will be found therein.

THE ADMINISTRATION OF JUSTICE UNDER MILITARY AND MARTIAL LAW. By Charles M. Clode, of the Inner Temple, Barrister at Law. London: John Murray, Albemarle Street. New York: Scribner, Welford and Armstrong, 654 Broadway. Price $6.

The author of this work has for many years been the legal adviser of the British War Department, and has published several works on cognate subjects. The book now before us is an exhaustive treatise on the relations between military and civil authority, and on the constitutional considerations involved in the arbitrary administration of affairs necessarily resorted to in time of war.

Inventions Patented in England by Americans.

[Compiled from the Commissioners of Patents' Journal.]

From January 18 to February 8, 1873, inclusive.

ANIMAL TRAP.—R. E. Dietz, New York city.
BOOT SEWING MACHINE.—L. R. Blake, Fort Wayne, Ind.
BREECH LOADING FIRE ARM.—J. Broughton, Brooklyn, N. Y,
CARBONIC OXIDE, ETC.—L. Stevens, Washington, D. C.
CLOTHES WRINGER, ETC.—S. G. Corliss, New York city.
DRESSING MILLSTONES.—S. Dean, La Crosse, Wis.
FIREPROOF SAFE.—J. W. Warren, Oneida, N. Y.
FIRE ALARM, ETC.—A. F. Johnson, Parkville, N. Y.
FIREPROOF VAULT.—J. W. Warner, Oneida, N. Y.
HINGE, ETC.—F. W. Nichols, Lynn, Mass.
FORCING LIQUIDS BY STEAM.—W. Burdon, Brooklyn, N. Y.
LAMP.—R. Hitchcock, *et al.*, Watertown, N. Y.
LECTURER'S APPARATUS.—R. G. Wells (of New York city), London, Eng.
LOCK WASHER.—J. Purdie, Buffalo, N. Y.
MAKING STEEL.—T. H. Alexander, Washington, D. C.
MOTIVE POWER, ETC.—O. J. Backus, A. F. Sawyer, San Francisco, Cal., A. M Loryea, East Portland, Oregon.
RAILWAY BRAKE, ETC.—J. Y. Smith, Pittsburgh, Pa.
REFRIGERATOR.—S. B. Martin, J. M. Beath, San Francisco, Cal.
RIFLING GUN BARRELS.—H. Berdan, New York city.
SCOURING WIRE, ETC.—G. Broomhead, Paterson, N. J.
SIFTING SHOVEL.—G. W. Dean, New York city.
SPINNING MACHINERY.—H. T. Potter, J. G. Lamb, Norwich, Conn.
TORPEDO LAUNCHES.—H. J. Smith, Boston, Mass.
WHITE LEAD, ETC.—A. P. Meylert, New Britain, Conn.

Recent American and Foreign Patents.

Improved Cotton Press.

Peter K. Dederick, Albany, N. Y.—This invention consists of a press so contrived that the bale is sacked at the same time it is pressed, by having the prepared sack gathered on the open end of a short pressing case, or on a holder of any kind, in connection with the pressing devices, so that the pressing and filling are accomplished simultaneously. This invention also consists of a movable press head against which the pressing is accomplished and which recedes from the follower as the pressing progresses under the control of a friction brake which regulates the measure of the compression.

Improved Mechanical Movement.

Charles W. Carr, Paola, Kansas.—This invention consists of a cam with three or five leaves or tappets and a connecting rod with a toe on each of two opposite or nearly opposite points across the axis and fronting the face. It is arranged in such manner that while the tappets or leaves act upon one toe the other is clear of them, and *vice versa*. Each toe is alternately acted upon, one being driven one way and the other the other way, so that three or five double movements of the connecting rods are obtained to one revolution of the cam. The contrivance is designed more particularly for operating the cutter bars of mowing machines and harvesters, but it is applicable to other machines.

Improved Cover for Pitcher.

Walter Bradley, Providence, R. I.—The object of this invention is to provide means for keeping pitchers or cups for containing milk, water, sirup, or other substance closed when not in actual use, and it consists in a cover which is automatic in its action.

Improved Door Check.

Alexander Hanna, Dover, Ky.—This invention consists of a double hooked plate pivoted to a bracket projecting from the base or mop board, both so arranged as to receive the edge of the door between them when it swings back, and to swing back a little with it and drop into a notch, by which the door will be prevented from striking against the wall and held from swinging shut. The invention also consists in having this bracket jointed together near the breast plate to swing up and be supported out of the way of sweeping the floor, etc., when required.

Feeding Screen for Bran Dusters.

George S. Cooper, Baraboo, Wis.—This invention consists in the arrangement of the shoe of a bran duster, the same having a perforate and imperforate portion, or spring supports, to be actuated in a forward and backward direction by an eccentric on the duster shaft, the said spring supports and the actuating apparatus being arranged to allow the shoe to be adjusted vertically either at one or both ends.

Improved Railroad Rail Joint.

James M. Clem, Opelika, Ala.—This invention consists of a flat pin or bolt with a slot near it through the point, which is used in place of the ordinary screw bolt to fasten the fish or joint plates, the bolt being fastened by a key and spring washer instead of the ordinary nuts and fastenings therefor, the key having a notch in the outer edge, so that a shoulder above and below the bolt becomes locked when the key is driven in, so that it cannot work loose.

Improved Spool Box.

Julius C. Bohn, Centralia, Ill.—This invention consists of a small box with several partition plates within and supports, for the ends of said partitions adapted for dividing the inner space into narrow spaces of different widths, suitable for containing several spools lying end to end, so as to roll when the thread is pulled. One side of the box, parallel with the rows of spools, has a number of notches in the upper edge, through which the threads from the spools may be drawn as required for use, the ends being left hanging out sufficiently to afford a hold for pulling out when thread is wanted.

Improved Screw Propeller.

Newton A. Patterson, Athens, assignor to himself, McKendrie F. Miller and Landon N. Miller, Rheatown, Tenn.—The invention relates to screw or spiral propellers, and consists in making the blade concavo-convex, with pointed extensions on the inner sides, and adapted to be arranged some distance from shaft and in planes oblique or spiral thereto. By this construction and arrangement the centrifugal tendency of the water is claimed to be overcome, while it is packed and forced out at the kite tail toward the axis of motion.

Improved Music Portfolio.

Frank C. Schumann, New York city.—This invention has for its object to furnish an improved portfolio for sheet music, which shall be so constructed as to adapt it for use as a rack for supporting a piece of music while being used, and it consists in the combination of a bracket with the side plates of an ordinary portfolio.

Improved Street Car Coupling.

John Stephenson, New York city.—This invention relates to a new and useful improvement in cars for street railways, and consists in the construction and arrangement of the draw pin and extension thereof, the draw head, and the keeper and spring. The pin is at all times under the control of the driver, so that it can be drawn at pleasure, and much more readily than in the ordinary manner. The shoulder stop above and below the keeper, with the spring on the opposite side, retains the pin in its proper position whether it is up or down.

Improved Angling Reel.

Charles L. Noe, Bergen Point, N. J.—This invention consists of a fan regulator with gearing connecting it with the reel gear combined with the reel, to prevent it from overrunning the line by its momentum when the hook is cast.

Combined Horse Rake and Tedder.

Geo. L. Ives, Rome, N.Y.—This invention consists of a hay tedder attachment to the truck of a hay rake for which a patent was granted to the same inventor August 13, 1872, No. 130,431. Said attachment includes a shaft (with arms attached for stirring or turning the hay) journaled in bearings or boxes swiveled in the rear ends of arms, whose forward ends are jointed to the wheeled truck shaft, and also to an intermediate frame, which latter is adapted to be readily connected to and disconnected from the truck, so that it may be made to alternate, in practical use, with a common wire rake attachment, which the truck is otherwise constructed to carry and operate.

Machine for Sharpening Gin Saws.

Jasper M. Bailey, Meridian, Miss.—This invention has for its object to furnish an improved machine for sharpening gin saws while on their shaft. The invention consists in constructing a file holder having a turned up end, which is connected by a link with the crank of a drive wheel, so as to give a reciprocating motion in the smallest space and without friction.

Improved Hand Planter.

Sidney S. Stults, Cedar Bluffs, Neb.—The invention relates to improvement in the class of walking corn planters. A staff is arranged with a handle at the top for carrying in the hand of the operator walking along the ground. In the bottom of the grain box is a grooved piece, in which a curved dropping slide, with a pocket for receiving the seed, works to draw it out of the grain box under a brush into the tube through which it falls to the space between the jaws. The latter make the hole in the ground by the staff being forced down, and they are opened by swinging the upper end of the staff forward so that the foot strikes the ground to arrest the forward movement of a lever, which carries one jaw. A spring throws the lever and slide forward and closes the jaws when the planter is raised out of the ground after one operation to be swung forward for the next.

Improved Rocking Chair Fan.

Alois Nissle and Josef Schöberl, New York city.—This invention relates to a new manner of connecting a rocking chair with a fan, so that the latter may be rotated alternately in opposite directions by the oscillating motion imparted to the chair, and consists in the application of a weighted lever to one of the chair rockers, and in its connection with an endless cord which passes over a pulley on the spindle of the rotary fan. The lever rests with its weighted end upon the floor, and remains thereon; and, consequently, as the chair is rocked, the relative positions of the rocker and lever will be changed, and the cord, which passes over the friction roller hung on the rocker, will be drawn over the roller and pulley, so as to rotate the latter and revolve the fan.

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Improved Animal Trap.

Frank Flora, Pierce, O.—This invention has for its object to furnish an improved animal trap, which shall be so constructed that the animal can not have his foot thrown from the trap in springing it, and so arranged that the animal can not draw his leg out of the jaws of the trap by eating off his foot. The invention consists in the jaws made with a rabbet or flange upon their inner sides, and in a toe formed upon the shank of the bait pan to catch upon the jaw in setting the trap.

Improved Lumber Chute.

William Van Name and James A. Wakefield, Chippewa Falls, Wis.—This invention consists in the construction and arrangement of a log chute with a double gate hinged together. It is arranged upon the bottom of the way between the side pieces with a water space under it, to which a passage is provided from the head of the chute to admit water under the hinged gate in order to regulate the hight of the dam, which the hinged gate constitutes when raised by the water below it. There is a passage to let the water escape from under the hinged gate when the dam is to be lowered. The invention has already been in operation, a chute having been erected with a slide 180 feet long, with a timber apron 45 feet, and fingers, or bars, projecting on to the surface of the water 40 feet, making a total distance of 215 feet. The apron allows the water to escape at the sides, and thereby deadens the force with which the lumber descends; and the fingers deliver the sticks horizontally on to the water, preventing their submersion. These operations are regulated by the amount of water let into the slide by the gate, and the inventor claims that the control of the descending lumber is perfect.

Improved Bedstead Fastening.

Joseph F. Mancha, Ridgely, Md.—This invention has for its object to furnish an improved fastening for bedsteads which shall hold the parts of the bedstead securely and shall enable the bedstead to be easily put together and taken apart. The invention consists in a fastening, formed of the casting for the post having a slot formed in its closed lower end, and shoulders formed upon the upper ends of the sides of its open upper end. The top casting for the side rail has shoulders formed upon its side edges, and the bottom casting for the side rail has a downwardly projecting flange formed upon its forward edge, said parts being constructed so that the strain comes upon all the screws laterally, which greatly increases the strength of the fastening.

Improved Spindle Bolster for Spinning Machines.

Charles F. Wilson, Northbridge, Mass., assignor to himself and Jesse E. Folk, Brooklyn, N. Y.—This invention relates to lubricating bolsters for spindles of spinning frames, and consists in an arrangement of a sleeve or box bearing having a reservoir on its upper end for receiving the oil, and central perforations and tangential plates or lips for co-operating with an inverted conical or tapered tube secured to the spindle to cause the lubricant to maintain a constant circulation, not only from the reservoir downward until the same is empty but subsequently in contact with a portion of the spindle.

Improved Carriage.

Thomas B. Patten, West Amesbury, Mass.—This invention relates to that class of buggies in which the top is supported upon fixed standards above the body; and it consists of standards with branches at each end secured by bolts passing through the branches and screwing into plates or nuts attached to the buggy body or top. The plates have two holes for both the bolts of a standard, and the bolts being of square or other shape at the head are adapted for being turned by a wrench. This mode of fastening the standards to the body not only facilitates the removal of the top when required, but it greatstrengthens the body.

Improved Land Roller.

John Woolridge, Dean's Corners, Ill.—This invention has for its object to furnish an improved land roller, which shall be so constructed that it will adjust itself to the surface of the land being rolled, which shall be of lighter draft and more readily turned than rollers constructed in the ordinary manner. And it consists in the cross bar with which the rollers are connected, made in two parts and connected with the tongue. It consists, secondly, in the mode of holding the rolls so that they will have a convenient lateral end movement, and in a mode of construction for locking and unocking automatically the two sections of connecting bar.

Improved Band Saw Gang.

Henry Sillman, Brooklyn, N. Y.—This invention has particular reference o the mode of adjusting the saws of band saw gangs. The arrangement of the saws on separate pulleys, having separate and independent shafts, allows them to be strained and adjusted separately, to suit the various purposes to which they may be applied. These saws are constructed either with or without teeth, to adapt them for sawing either wood, marble or stone.

Improved Packing Box.

Ludolph A. Fullgraff, New York city.—This invention consists of a packing box formed, as to its sides or body, of wood, and as to its top and bottom, of paper, thus constituting a new article of manufacture, cheaper and lighter than other boxes of its class, and yet equally serviceable.

Improved Weather Threshold.

John W. Kramer, Bloomsburg, Pa.—The invention relates to improvements on the door strip for which United States Letters Patent numbered 106,835 were granted to the same inventor August 30, 1870. The present invention consists in a new manner of connecting each door strip with a spring lever in the side of the door case, by means of which the strip will be raised in a more perfect manner when the door is shut.

Improved Horseshoe Nail Machine.

James Mills, Keeseville, N. Y.—This invention relates to the horseshoe nail machine patented to H. E. and C. W. Woodford, October 30, 1866. In one machine the inventor unites the advantages of the revolving roller hammer and the intermittingly revolving anvil, by which, together with the striking hammers, he claims to make the device perform nearly double the usual amount of work.

Apparatus to be used in connection with Coal Car Elevators.

Philip H. Lamey, Wiconisco, Pa.—The invention relates to car elevators but more particularly to such as are employed in transferring coal from the bottom of mines up a slope and to a landing, from whence it is discharged The invention consists in a pivoted stop, which is operated simultaneously with a signal to the engineer, by a single topman who stands on the landing, in pushers arranged in the car to carry it forward to the beginning of the slope after the mules have been removed; in a truck arranged in a pit below the level of the car track to work the pusher; in making a longitudinal channel through the middle of the truck, to allow the rope to play vertically according to the positions of the car, and, laterally, according to the position of the rope on the drum; also on a novel catch pivoted over the rope channel, bifurcated and curved to allow the transfer of the truck to the discharge end of the landing at the same time with the car; in arranging a rising track up which the pusher is moved to take its proper position against the bumpers of cars; in pivoting the rising track which brings the pusher into proper position behind bumpers of car, to the end of the upper track, and allowing it to take its position on the lower track, so as to rise and fall automatically, and in placing a friction disk on each side of the pulley on which the rope rests, and friction slides on the bottom of the car to prevent the rapid wear which otherwise takes place on the wire ropes.

Improved Lifting Jack.

S. Spencer Eccleston, South New Berlin, N. Y.—This invention relates to an improvement in the class of wagon jacks whose lifting lever is provided with a pawl operated by a rod extending to the handle portion thereof; and the improvement consists in the arrangement of parts, whereby the hand of the operator is, in practice, applied simultaneously to both the main lifting lever and the lever for holding the pawl engaged with the toothed rack of the vertical standard. By this construction the pawl may be operated from the rear end of the lever, however long said lever may be, thus allowing the lever to be made of any required length to obtain any desired leverage

Improved Hat Stretching Machine.

Samuel Goodman, Natick, Mass.—This invention has for its object to improve the hat stretching apparatus which is described in the patent of Rudolph Eickemeyer, issued February 28, 1865, numbered 46,553, and reissued December 1, 1868, numbered 3,217; and the invention consists in the use of a jaw for hat stretchers having a curved convexity on its working face, and on its rear face end a spring rod connecting it with an arm, so that the hat may be stretched from the tip downward.

Improved Fire Kindlers.

John Y. Marks, Rochester, Pa.—This invention relates to compositions used for igniting fires; and consists in pulverized cannel coal, melted resin, sawdust and alcohol. The resin is melted in any suitable vessel, and the powdered cannel coal, sawdust, and alcohol are added while the resin is hot, so that the ingredients may be thoroughly mixed together. When thus mixed the composition is spread out while it is in a semi-fluid state, and cut into pieces of suitable size for use. The fire kindler thus prepared emits no odor, and may be kept in any part of the house.

Improved Railroad Track.

Daniel S. Tuthill, Newburgh, N. Y.—This invention consists of a short rail alongside of the main rails at the joints, either inside or outside of the two rails of the track, and wheels adapted to transfer the weight of the cars or the principal portion of it to these short rails while passing the joints of the main rails, to avoid the pounding and jarring due to the springing of the ends of the rails as the wheels pass over them.

Improved Tug Fastening.

Jonathan Turley, Mitchell, Ind.—The invention consists in a mode of connecting the traces and whiffletree by which horses draw a vehicle, plow, or cultivator, so that no outer projection can come in contact with another object and catch thereinto. Near the rear end of the trace is applied any suitable hook. The whiffletree is provided with an end sleeve and loop, having their front edges in the same vertical plane. The snap hooks being placed in the eyes, the trace presents a smooth outside, and its rear end projects backwardly a little beyond the end of swingle tree. By this arrangement it is impossible that the end of swingle tree or of the snap hook can catch on any object whatever.

Improved Spindle Step for Spinning Machine.

Charles F. Wilson, Northbridge, Mass., assignor to himself and Jesse E. Folk, Brooklyn, N. Y.—The invention is an improvement in lubricating devices for spindles of spinning frames, and has reference to the construction of the case or holder for the spindle step. The step is placed in an oil reservoir or shell. The step box is made from a solid piece of metal, bored out for the step of the spindle and for the passage of the oil. The oil is introduced into the reservoir through an orifice in which a lip is made in punching, against which the tube of the oil can will strike instead of striking the spindle. Holes are bored from the top of the step box to a point a little below the bottom of the spindle orifice connecting with a small hole bored to the center of the spindle orifice. The step of the spindle is beveled to an angle of about forty-five degrees, so that the oil which is forced up through the small hole readily spreads and perfectly lubricates the extreme end of the spindle. The oil reservoir may contain more or less oil; it may be filled to near the orifice, so that the step of the spindle will always run in oil. The top of the oil reservoir is turned in around the spindle so as to exclude lint and dust. The step box is confined in the bottom of the shell and the latter is confined in the rail, so as to correspond in position with the spindle bolster in the rail above.

Improved Baking Pan.

Among the recent patents is that of R. D. McDonald, Jersey City, N. J., for his Excelsior Roasting and Baking Pan, which we have given a practical trial. It consists of an ordinary oven pan for baking bread, roasting meats, and other articles of food, the principal novelty being in a convex cover which fits tightly over the pan, and by its convexity forms a vapor chamber above the food. The cover is provided with a suitable fastening by which it is locked upon the pan, and also with a small valve. When bread, poultry, meat or other food is placed in the pan and deposited in the oven, the vapors arising therefrom are confined, and the cooking is carried on at a low temperature, which is essential to good cooking. Our experience is that food placed in this device is well cooked and improved in flavor. It ought to have a place in every household, for it is a valuable addition to the utensils of the kitchen.

Improvement in Feeding Sheets of Paper to Printing Presses.

By S. Schofield, Providence, R. I., and Charles E. Baker, Mt. Clair, N. J.—These inventions consist in pressing upon the top sheet of a pile of paper with a non-penetrating point or instrument while the sheet is being moved, so as to cause the instrument to tear through the sheet and retain a slight chip under the point, the friction between the top and second sheets being thereafter insufficient to move the second sheet from under the pressing point, practically holding the second sheet, through the first, while it (the first sheet) is being removed. The removal of the top sheet, after this process of separating it from the second one, is accomplished in various ways, according to the nature of the pressing points, which are made differently for different machines on which the paper is to be used. These inventions, if practically successful, will materially simplify the business of printing and do away with much of the annoyance heretofore experienced from the carelessness and incompetency of the hands employed in press rooms.

Improved Piano Agraffe.

Charles F. Chickering, New York city.—The invention consists in dispensing with the bridge which is usually placed back of the agraffe, and furnishing the required double support by two points in the agraffe itself.

Improved Track Lifter.

Aug. H. Arnot, Morristown, Tenn.—The foot piece or base of this implement, which in its general form is somewhat similar to ordinary lifting jacks, is formed of two parts, and is long, narrow, and beveled at its front end to adapt it to be thrust beneath the rails of a track. The lever is pivoted between the two parts, and a pawl is pivoted to the vertical standard to adapt it to engage with ratchet teeth formed on the handle or power end of the lever. The implement is light, strong, and efficient, saving much and severe manual labor.

Improved Ditching Machine.

William T. Hoskins, Livia, Ky.—In this invention a wedge-shaped ram, operating to form a drain or ditch by compression, is mounted in a traveling frame, which receives a progressive movement at the end of each stroke by devices actuated through the same mechanism which elevates the ram for a repetition of the stroke.

Improved Rotary Steam Engine.

Dr. John F. Early, near Ruckersville, Va.—The invention consists in combining, with the piston wheel of a rotary steam engine, a series of rotary valves that are brought by pistons into such a position as to admit steam and act as an abutment thereto while actuated by cams on the piston wheel to cut off steam at any desired point.

Improved Construction of Books.

John C. Bonnell, Burlington, Iowa.—The invention consists in making a blank book with one full folio, while the rest are cut out, and in filling the vacant space with a block.

Improvement in Butter Pails.

Much difficulty has been heretofore experienced in the production of what are known as return pails, for farmers' use, for want of a simple but secure mode of fastening the cover. In the transport of so weighty an article as butter, everything about the package must be very strong; and it must be tightly closed, otherwise the butter will be exposed to damage; the fastenings must be simple and strong, or they will soon become disordered and useless. These difficulties are all overcome in the improved fastenings and butter pails made under Decker's and Westcott's patents, by the Orange County Pail Company, 179 Readestreet, New York, who are now supplying the market with a reliable and excellent article.

Improved Packing for Piston Rods, etc.

Leopold Katzenstein, New York city.—This invention relates to improvements of the packing described in letters patent No. 105,462, and dated July 19, 1870. The object of the present invention is to insure the proper adjustability of the rings and also to facilitate their insertion within and removal from the packing box. The invention consists in forming the cut rings with spaces between the ends of their several sections, and also in providing them with screw sockets to permit the application of screw rods for the insertion and removal of the rings.

Improved Sheep Holder.

Samuel Tucker, Wabash City, Ind.—The object of this invention is to provide convenient means for holding sheep while they are being sheared; and it consists in a frame or holder attached to the table or bench, so constructed that the legs of the sheep are secured by clamp bars confining the sheep on its side in a humane manner convenient for the shearer

Improved Lock for Sewing Machines.

Edward L. Gaylord, Bridgeport, Conn.—This invention has for its object to furnish an improved sewing machine lock which shall be so constructed as to require no second hole in the striker plate to receive a steady pin to prevent the case from sliding upon the table; and it consists in the combination of a fixed projecting plate or steady pin with the locking hook of the lock.

Improved Universal Joint Coupling.

Henry B. Whitehead, Holly Springs, Miss.—This invention consists in the use of hemispherical gears forming the contiguous ends of two shafts, which are hung in sleeves, and the combination therewith of slotted, pivoted side plates or links and adjusting screws, all suitably arranged to permit the shafts to be set at an angle to each other, and yet permit their rotary movement at said angle in like manner as when the same are in alignment.

Improved Combined Blind Opener and Slat Regulator.

Adin Ball, Milford, Mass., assignor to himself and Charles P. Nelson, of same place.—This invention has for its object to furnish improved fixtures for window blinds which shall be so constructed that the blind may be opened and closed to any desired extent without raising the sash, which will hold the blind securely in any position into which it may be adjusted, and which will close the slats automatically when the blind is closed.

Improved Device for Feeding Stoves.

Bernard Connelly, Williamsburgh, N. Y.—This invention has for its object to furnish an improved coal scuttle, so constructed that the coal may be introduced into the stove in such a way as to prevent the escape of gas. The upper part of the body of the scuttle is made in the form of an inverted frustum of a cone, and its lower part is made in the form of a cylinder and of such a size as to enter the hole in the top of the stove. The cylindrical part of the body is provided with an outwardly projecting flange, to rest upon the top of the stove and support the scuttle. The cover of the scuttle is made in two unequal parts. The smaller part is made fast to the upper edge of the body, and to its edge is hinged the edge of the larger part. The bottom of the scuttle is made in two parts, which may be equal in size. One part of the bottom is stationary, is placed in an inclined position, and its edge is secured to the body. To the lower edge of the stationary part of the bottom, is hinged the edge of the other part in such a way that the said hinged part may be swung above and below a horizontal position. To the hinged part of the bottom, near its outer or free edge, is secured the end of a chain which passes up through a hole in the stationary part of the cover, and has a cross bar or other stop attached to its free end to keep it from being accidentally drawn through. The hinged part of the bottom is supported in a horizontal position by passing a pin through a link in the chain above the stationary part of the cover. In feeding the stove, the cover is removed from the hole in the top of the stove, and the cylindrical part of the scuttle is inserted in said hole. The locking pin is then withdrawn from the chain which allows the hinged part of the bottom to drop.

Improved Coffee Pot.

Edward Heinson Huch, Brunswick, Germany.—This invention consists in the arrangement of a pot which is set over a lamp, or over a gas flame, and closed air-tight by means of a cover, the rim or flange of which dips down into water contained in a deep trough that is formed around the pot. The lid of the pot is connected with the regulator of the lamp or gas flame. When steam is generated within the pot, the lid commences to rise, and, acting upon the regulator, it causes the flame to be decreased in size until the steam ceases to be generated with sufficient rapidity to raise the lid higher. This pot has an inner vessel fitting closely within it at the upper part, and this inner vessel has a perforated bottom, covered with felt, flannel, or similar material, on which the coffee rests. A pipe descends through the perforated bottom of the inner vessel, nearly to the bottom of the pot. When the water in the pot boils, the pressure of the steam drives the water up the pipe into the upper vessel, and over the coffee. The water then comes in contact with the lid. The lid is made to enter and descend some distance into the inner vessel. When the water rises up to the lid, the lid floats. Being thus lifted, by means of apparatus connected with it, it extinguishes the flame beneath. The steam in the lower part of the pot condenses as the pot becomes cooler, and the vacuum so formed causes the water to descend through the coffee, and the infusion is then ready to be drawn off for use.

Improved Tube Welding Machine.

James Sadler, New York city.—This invention consists in a machine for facilitating the operation of welding tubes, more especially designed for the tubes of steam boilers, which have failed at their ends and been reversed. With this apparatus it is claimed that one man only is required, and he alone can weld a tube in much less time and in a more perfect and workmanlike manner. The tube to be welded is heated in the forge, resting on a bracket of the forge and on a lower die. The end of the tube is expanded and, the piece of tube being inserted previously, when a welding heat is obtained the tube and piece attached are slipped along the die so that a ball slipped on or formed on the rod will be directly under the joint. The hammer is now applied to the shank of the upper die with light quick blows while the tube is revolved by the other hand of the operator. Springs raise the upper die from the tube slightly, so that the tube may be readily revolved.

Improved Refrigerator for Preserving Butter, etc.

George B. Rohrer, Oxford, Ohio.—This invention consists of a refrigerator of double walls, with a space between packed with wool for the non-conducting substance. The interior is made in three compartments, in the middle one of which the ice is placed. The others are made of larger dimensions and contain metal pans on which are flanges which hold them in place, and cause them to fit snugly within the walls of the compartment. The sides and bottoms of the pans are provided with strengthening ribs. Three or more pans will be placed in a chamber, one above another, shallow pans being preferred. To divide the butter in small packages, in which it is preserved better than in large ones, the pans will not be filled quite full. They have a series of ventilating holes in the sides, a little below the top, for the cold air to enter, while the warm air escapes over the top.

Improved Pavement.

Milton E. Worrell, Monmouth, Ill.—This invention has for its object to furnish an improved pavement for sidewalks. Iron plates are formed of suitable size, and with cells in their upper sides to receive wooden blocks The partitions between the cells should be made to make the cells tapering, so that the wooden blocks may be driven into them. The plates are made with downwardly projecting flanges upon their side edges, and with downwardly projecting cross flanges, and are also strengthened by brace or stay rods. The sections are secured to each other by bolts passing through the side flanges, rubber or other elastic packing being interposed between them, of sufficient thickness to enable the sections to expand and contract with changes of temperature without breaking them or loosening or weakening the pavement, and always keeping a water-tight joint. The pores of the blocks should be filled with asphalt or other substance that will prevent the water from soaking in.

Improved Device for Making Cigarettes.

Hugo Gerike, Berlin, Prussia, assignor to Bruno Harrass, Böhlen, Germany.—This invention relates to a new machine for filling cigarettes without touching the tobacco with the fingers, and which can be used by smokers to make their own cigarettes, and also by manufacturers. The invention consists chiefly in the use of a spiral tobacco feed, arranged to rotate within a tube and combined with a movable guide or needle stopper thereon, all arranged to operate automatically when the spiral blade is turned. The tobacco receptacle being filled with tobacco, ordinary cigarette wrappers are next prepared, large enough to pass easily over a small cylinder. The length of the wrappers must be the length of the cylinder inclusive of the stopper. The wrapper is pushed over the stopper and down over the cylinder, an easy operation, as the stopper is somewhat conform. The pouch is next taken hold of near the bottom with the left hand and pressed slightly. A handle or crank is next turned with the right hand toward the right. This causes a spiral blade to be revolved and to screw tobacco into the tube against the stopper. The tobacco in fact is forced out of the tube and raises the stopper to which the paper wrapper adheres. Thus the wrapper is filled with tobacco. When the wrapper has been entirely filled it is automatically detached from the tube to make room for another. During the motion the wrapper is guided by a needle.

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Business and Personal.

The Charge for Insertion under this head is $1 a Line.

For Milling Machines, see advertisement of Brainard Milling Machine Company.

The best Pattern Letters now before the public are manufactured by S. E. Adamson, No. 5 Dey St., N.Y. City. Send Stamp for Catalogue and Price List.

Chucks—Our Chucks are of the very best material & workmanship. Fairman & Co., Baltimore, Md.

Screw and Drop Presses, Fruit Can Dies and Dies of every description. Thomas & Robinson, Cinn., O.

We have a Packing Box Factory in Michigan, and want some party in New York to nail and deliver to city trade, we furnishing shooks. Address, with reference, A. G. Bissell & Co., E. Saginaw, Mich.

For Sale—The Patent of the Sliding Support for Clothes Lines, pat. Jan. 14, 1873. M. Bubser 114 Newark Avenue, Jersey City.

Patent No. 126,693, for Steel Spring Lamp Chimney Cleaner. Price only $1,000. L. Granger, Patentee, Armada, Mich.

Wanted a good machinist, with small capital, to engage in manufacturing and repairs. Nearest shop 18 miles; only shop in county. Or will sell—all new. Ladd & Parker, Elmore, Ohio.

Buy Improved Car Machinery of Gear, Boston, Mass.

For Sale—An established manufacturing (wood working) business, in one of the best sections of country in Illinois. Capital required, $8,000; more can be used. Or will take in partner. Address H. Bevis, Virginia, Ill.

Wanted—The address of every intelligent reader of the SCIENTIFIC AMERICAN, to whom will be sent free a specimen number of the *Illustrated Phrenological Journal*. Address S. R. Wells, Publisher, 389 Broadway, New York.

The Safety Valve—Buy B. M. Johnson's Safety Valve Guide. Any person can learn all they wish of the Safety Valve. Price $1.50, post paid. Address Box 133, Post Office, Greenpoint, L. I.

Indispensable to every Manufacturer and Machinists—Boston Journal of Commerce; send for a specimen copy. $3 per year.

Machinists' grindstones, Mitchell, Phila.

Pulleys ground cheaper and better than by turning. Suitable grits by Mitchell, Philadelphia.

Wanted—A partner to help introduce the best Hay Stacker and Carrier ever invented; saves backing the horse. Patented through the SCIENTIFIC AMERICAN. Address C. H. Kirkpatrick, Sugar Grove, Indiana.

Operates like a sewing machine engine—Agents wanted for steam engine models. E. P. Ryder, 19 Ann St., New York.

Wanted—Agents to travel and sell "Stilwell's Pat. Lime Extracting Heater," and "Eclipse Turbine Water Wheel," on commission. Liberal inducements to good parties. Stilwell & Bierce Manufacturing Company, Dayton, Ohio.

Small Printing Press Wanted—C. S. Bennett, Crawfordsville, Iowa.

Buy Gear's Improved Car Boring Machine, Boston, Mass.

Belting as is Belting—Best Philadelphia Oak Tanned. C. W. Arny, 301 and 303 Cherry Street, Philadelphia, Pa.

Wanted—Superintendent, capable of managing a manufacturing establishment embracing a general Foundry business, Architectural Iron Work and Machinery. Must be a first class man of practical experience. Address A. H. Massey, Cleveland, Ohio.

For the best Endless Bed or (Farrar) Surfacer, address Davis, Hatch & Co., 436 North 12th Street, Philadelphia, Pa.

Wanted—An experienced manufacturer of Door Locks and light hardware, with $10,000 Capital, to take charge of Shops. Edward Rowe, Jr., Mansfield, Ohio.

Tin Ware Manufacturers should see the patent Weighing Scoop. For Sale, or Worked on Royalty. D. H. Priest & Co., 3 Tremont Row, Boston, Mass.

J. R. Abbe, Manchester, N.H., sells Bolt Vises.

Millstone Dressing Diamond Machine—Simple, effective, durable. For description of the above, see Scientific American, Nov. 27th, 1869. Also, Glazier's Diamonds. John Dickinson, 64 Nassau St., New York.

Circular Saw Mills, with Lane's Patent Sets; more than 1200 in operation. Send for descriptive pamphlet and price list. Lane, Pitkin & Brock, Montpelier, Vermont.

We wish to correspond with some party who understands bleaching and refining oils. Any one who can bleach a dark, mixed oil, so as to make it a clearer merchantable article, will be well paid for doing it, or for the process. Samples sent on application to Lock Box 199, Pawtucket, R. I.

To Purchase—A large amount of Second Hand Machinery. Any parties having Engine Lathes, Iron Planers, Drills, &c., in large numbers, who wish to dispose of them cheap for cash, will find a purchaser on application to W. A. James, Roche & Spencer, 273 South Canal Street, Chicago, Ill.

Peck's Patent Drop Press. For circulars, address the sole manufacturers, Milo, Peck & Co., New Haven, Conn.

For 8, 10, 12 & 15 horse Steam Engines, with Link, cut-off, and reversing motion, address, for circular, E. West, Lockport, N. Y.

Tree Pruners and Saw Mill Tools, improvements. Send for circulars. G. A. Prescott, Sandy Hill, N.Y.

Five different sizes of Gatling Guns are now manufactured at Colt's Armory, Hartford, Conn. The larger sizes have a range of over two miles. These arms are indispensable in modern warfare.

Fire Clay and Limestone Mills, which wear onger than any others made, cast to order by Pittsburgh Casting Co., Pittsburgh, Pa. All work warranted.

The Berryman Manuf. Co. make a specialty of the economy and safety in working Steam Boilers. I. B. Davis & Co., Hartford, Conn.

Carpenters—For Sale, a Sash Factory, run by water power, at a lumber landing, with a profitable run of trade. For particulars, address P. O. Box No. 2, Charlestown, Jefferson County, West Virginia.

For 2, 4, 6 & 8 H. P. Engines, address Twiss Bro., New Haven, Conn.

The Berryman Heater and Regulator for Steam Boilers—No one using Steam Boilers can afford to be without them. I. B. Davis & Co.

Needle and Clock Machinery of every description of the most Improved Styles. Hendey Bro's, Wolcottville, Ct.

Shafting and Pulleys a specialty. Small orders filled on as good terms as large. D. Frisbie & Co., New Haven, Conn.

All Fruit-can Tools, Ferracute, Bridgeton, N.J.

English Patent—The Proprietors of the 'Heald & Cisco Centrifugal Pump" (triumphant at the recent Fairs), having their hands full at home, will sell their Patent for Great Britain, just obtained. A great chance for business in England. Address Heald, Sisco & Co., Baldwinsville, N. Y.

Read the article on "The Machinists," now being published in the Boston Journal of Commerce. Send for Specimen Copy.

American Boiler Powder, for certainty, safety, and cheapness, "The Standard anti-incrustant." Am. B. P. Co., Box 797, Pittsburgh, Pa.

Williamson's Road Steamer and Steam Plow, with rubber Tires. Address D. D. Williamson, 32 Broadway, N. Y., or Box 1809.

For Steam Fire Engines, address R. J. Gould, Newark, N. J.

Brown's Coalyard Quarry & Contractors' Apparatus for hoisting and conveying material by iron cable, W. D. Andrews & Bro. 414 Water st. N. Y.

Always right side up—The Olmsted Oiler, enlarged and improved. Sold everywhere.

For Solid Wrought-iron Beams, etc., see advertisement. Address Union Iron Mills, Pittsburgh, Pa., for lithograph, etc.

Mining, Wrecking, Pumping, Drainage, or Irrigating Machinery, for sale or rent. See advertisement, Andrew's Patent, inside page.

Gauges, for Locomotives, Steam, Vacuum, Air, and Testing purposes—Time and Automatic Recording Gauges—Engine Counters, Rate Gauges, and Test Pumps. All kinds fine brass work done by The Recording Steam Gauge Company, 91 Liberty Street, New York,

Hydraulic Presses and Jacks, new and second hand. E. Lyon, 470 Grand Street, New York.

Machinists—Price List of small Tools free; Gear Wheels for Models, Price List free; Chucks and Drills, Price List free. Goodnow & Wightman, 23 Cornhill, Boston, Mass.

Boynton's Lightning Saws. The genuine $500 challenge. Will cut five times as fast as an ax. A six foot cross cut and buck saw, $6. E. M. Boynton, 80 Beekman Street, New York, Sole Proprietor.

Absolutely the best protection against Fire—Babcock Extinguisher. F. W. Farwell, Secretary, 407 Broadway, New York.

Steel Castings "To Pattern," from ten lbs. upward, can be forged and tempered. Address Collins & Co., No. 212 Water St., N. Y.

The Berryman Steam Trap excels all others. The best is always the cheapest. Address I. B. Davis & Co., Hartford, Conn.

For best Presses, Dies and Fruit Can Tools, Bliss & Williams, 118 to 120 Plymouth St., Brooklyn, N.Y.

Covering for Boilers and Pipes. The most economical and durable article in use. Took first prize at American Institute Fair. Van Tuyl Manufacturing Company, 528 Water Street, New York.

A Superior Printing Telegraph Instrument (the Selden Patent), for private and short lines—awarded the First Premium (a Silver Medal) at Cincinnati Exposition, 1872, for "Best Telegraph Instrument for private use"—is offered for sale by the Mercht's M'f'g and Construction Co., 50 Broad St., New York. P. O. Box 6865.

Notes & Queries

1.—G. T. P. says: How can I make good red sealing wax?

2.—T. E. B. asks: How can I remove clinkers from the inside of a stove?

3.—E. R. asks what is the best way of resuscitating a person apparently drowned?

4.—W. T. H. says: Please let me know what is put on the tin oval butter kettles to make them look like silver, and how it is made and applied.

5.—T. G. asks: Will some one give full directions for making a solid emery wheel ¼ inch thick and 6 or 8 inches in diameter for cutting slots in rough castings?

6.—P. asks for the *modus operandi* of producing "Grecian painting," also for the transparent varnish for the same.

7.—J. M. asks for a method of treating old oil paintings, which have been almost obliterated by frequent and bad varnishing; also for the best way of treating a painting on panel of which the wood is cracked.

8.—G. E. H. claims to have a process for tinning cast iron, which he has tried with success both on finished and rough castings. He asks: Has nothing of the kind been done before, and if not, to whom is it of the most value?

9.—E. H. asks: What is proper speed per minute for a common wood turning lathe, and also for a circular saw from 8 to 12 inches in diameter? What is the best method of tempering cast steel for common wood cutting tools?

10.—P. P. has often observed such birds as eagles, hawks, and turkey buzzards, and wishes to know how they can gyrate and ascend by a spiral course without any motion of their wings and tails. As a phenomenon utterly at variance with the laws of gravitation, P. P. thinks it deserves investigation.

11.—H. says: I have a great many horses with tender feet, having what I call corn on the inside of the heel of the fore feet. I have been trying many ways to cure it, and I wish to know if there is any certain remedy, and what is the cause.

12.—L. says: I have a house organ which troubles me by giving every pulsation of the bellows feeders when less than half the instrument is in use. The reservoir for wind is three feet six inches by three feet, rising twenty-two inches, with two feeders of the usual construction. Can any correspondent tell the cause or its remedy?

13.—W. H. says: Is there such a society as a co-operative grocery store in this country, from which we can get a copy of the constitution and bye laws? If so, where is it, and what is its name?

14.—S. W. P. asks: What system of phonography is most used by the reporters of the press at the present time? Which is the easiest to learn, and can phonography be well learned without a living teacher?

15.—A. S. G. says: I recently saw a receipt for liquid glue in the SCIENTIFIC AMERICAN, stating that nitric ether would dissolve glue. I have had some white glue soaking in this ether for nearly three weeks, and find no solution; the glue has become leathery, with no further change. Can you tell me anything practical about this

14.—A. K. asks: Are there any power looms for weaving sacking out of the Mexican "istle," and machinery for transforming that fiber into the necessary thread, in existence? Istle is a very hard and cross grain fiber, about as stiff and thick as horse hair. The threads used for sacking are two cord and ⅛ inch diameter, making 3 to 4 meshes to the inch. The sacking is now all made by hand, and I would like to know if and where any simple machinery, to make such coarse fabric, is to be had.

G. S. T. says: My mouth is full of your praise! You are at the pinnacle of wisdom, and are ever ready to impart instruction to your subscribers. Please tell me (1) how I shall prepare a black board upon the wall of a room? I have read and racked my brain without success, and, without your help, I will abandon the task. 2. Which arrangement of a stove pipe is the better, a straight slanting or a perpendicular and then a horizontal one? Which would secure the best draft? Should the chimney be contracted at the top or a little enlarged, and should it be closed just below where the pipe enters it? 3. Am I right in believing that some glass is not a non-conductor of electricity? I find it impossible to construct a Leyden jar of the ordinary fruit jar or bottle green glass. 4. How long before the United States mail will remove my anxiety by bringing on my SCIENTIFIC AMERICAN of February 15? Answers: The editorial countenance is suffused with blushes as the compliments of our gushing correspondent become fully comprehended. 1. Send for the preparations of the dealers in silicate slate; or mix shellac varnish with any slightly gritty material and lay on rapidly with a brush. 2. The fewer the bends the better. Make the chimney straight. It does not pay to attempt a deviation from the uniform sectional area. 3. Some glass, especially that containing iron oxide or the oxide of lead in considerable quantities, it is stated by President Morton and other authorities, is sometimes quite a good conductor. A hard glass, without iron or lead in excess, is the best non-conducting glass. Good non-conductors, such as are used in insulating the best submarine wires and in insulators, are better than any glass. 4. "For ways that are dark and tricks that are vain" commend us to some of the agents of the Post Office department. Do not despair, however.

J. M. W. says: 1. Can you tell me the composition of printers' ink, both black and in colors; also the composition of inking rollers? 2. Can you tell me whether, in stuffing animals, the natural eyes are ever left in? Answers: 1. Printing ink is essentially a combination of lamp black and oil; the best is obtained from the smoke of naphtha and boiled linseed oil. The rollers are made of glue and molasses. 2. Apply to some reputable taxidermist. We have many enquiries of this nature, and our readers can probably find replies to them by watching our advertising columns.

G. W. K. asks for some idea of the first cost, and cost per day of the calcium light. Answer: About $50 first cost for apparatus, and 50 cents to $1 an hour to run it.

A. B. S. says: I have a dispute with a friend o mine with regard to a piece of rubber. My friend maintains that it is devulcanized, "that the mere trace of sulphur that it contains is not in chemical union with the rubber, that the quality of the rubber is not injured and that it is in a suitable condition for manufacturing purposes." I maintain that the rubber is not devulcanized or only slightly so, that its quality is injured, and that it is not in a condition to be worked into rubber fabrics. We refer the matter to you, and upon your decision rest three year's subscription to the SCIENTIFIC AMERICAN. Answer: To decide this question, an analysis would be necessary, and our time is too much occupied to allow us to do it.

E. R. S. asks: 1. By what means can ordinary writing ink be given that intense, shining gloss which some kinds have? I have a small ink well in one of the desks at school, made in the ordinary way of glass within zinc, in which after the ink has stood several days, it is found to have this gloss, I suppose the zinc must produce some chemical action in union with the acid in the ink. 2. Can you inform me in what way a letter should be addressed to the Emperor of Russia, and how it should be sent? Answers: A fine gloss is imparted to ink by the use of gum arabic solution. For copying, the following is a good recipe: Mix thirty grains of extract of logwood, seven grains of crystal soda, and half an ounce of water. Boil till dissolved; then, while stirring well, add thirty grains of glycerin, one grain bichromate of potash previously dissolved, and four grains of powdered gum arabic. 2. A letter sent by mail addressed to the Emperor of Russia, St. Petersburg, would reach its destination if prepaid.

J. M. asks how to treat oiled walnut wood to polish it without varnishing. Answer: The directions given on page 72 of our volume XXVI. will no doubt serve your purpose.

L. F. A. L., of Cal. The only metallic substances in the minerals you send are pyrites and oxide of iron. It is an old idea to propel vessels by means of endless belts of paddles. Placing floats around the edges of boats, filled with cork or inflated by air as you propose, is also very old.

W. H. W. asks: Will shrinking a cast steel tire of ordinary thickness on the circumference of a cast iron locomotive driver affect the central hole of the latter? Answer: We presume not. Ask the skillful railroad superintendent at the Marquette railroad repair shops to try it and send us results.

B. N. C. would like to know if there is a rule for cutting patterns, such as tin and sheet iron workers use. Answer: Study the "Sheet Metal Worker's Instructor," by Warn.

P. J. C. sends a mineral specimen found imbedded in limestone, and asks what it is. Answer: The mineral you send is iron pyrites.

J. J. C. comments on our reply to J. H., who asked how the outside wheel of a locomotive or car on a curve keeps pace with the inside wheel, on account of the distance to travel being greater, both wheels being fast on the axle. Our answer was: "With wheels of equal size, having cylindrical bearing surfaces, one or both must slip on the rail. The wheels of the cars on railroads are coned to avoid the difficulty, their diameter on the outer edge of their bearing or tread being less than that of the portion of the tread next the flange. In turning a curve the wheels ride toward the outer rail, and thus, to some extent, if not wholly, this tendency to slip is prevented." J. J. C. says: I claim that coning of the wheel is more of a damage than a benefit in rounding a curve, for this reason: The wheels, being in pairs of equal diameter, will roll the flange of the outer wheel hard against the outer rail and set so tight to the head of the rail that the wheel on the inner side, merely touching the top portion of the rail, will slip, being the easier of the two Any one can demonstrate the fact by the experiment of taking one wheel of 30 inches and another of 29 inches diameter, and keying them on to an axle. Then move them forward on a level floor, and they will describe a circle; but take two pairs of such wheels and construct a car truck, the wheels being fastened as truck wheels are. Now push this truck forward over a smooth surface, and it will be found upon examination that the small wheels have slipped and the large ones have traveled in a straight line. This proposition will convince any mechanic that the coning of car wheels is a damage rather than a benefit to the safety of traveling on the rail. Answer: Our correspondent's experiments confirm fully our former statements.

C. C. says to J. D. W., who asked of what material a mold for casting a small engine cylinder should be made: I have a good cylinder that I cast in a mold made of pine wood. Take a block of the length you wish your cylinder to be, bore a hole through it, and put in a core. Cut through one side for your valve seat, make some small pieces of wood to the shape and size you want your ports to be and fasten them into each end of the core, and fix your exhaust to the bottom of the mold. Cover the ends and side and pour in your metal. I used block tin with a little zinc, mixed.

C. T. says, in answer to T. C. M. who asked for directions for gilding on marble, porcelain, etc.: I use, for sizing, equal parts of elastic copal varnish and fatty linseed oil slightly diluted with turpentine. The time required to produce the requisite "tack" is about 24 hours. Barbers' shaving mugs have been treated in this way with success; but, if the articles are such as require repeated washing and rough usage, it may be well to cover the gilded portions with a coat of good varnish.

S. L. D. replies to S. T. W., who asked how to transfer engravings on glass: First coat the glass with a varnish composed of balsam of fir diluted with turpentine, then press the engraving on smoothly and evenly, being careful to remove all air bubbles; let it stand for about 24 hours, then dampen the back sufficiently to allow the paper to be rubbed off by the forefinger, rubbing it till a mere film is left on the glass; then varnish again. When dry, it is preferable to put a yellow paper on the back of it, next the varnish, which adds greatly to the beauty of the picture.

H. A. B. says: I am taking the position of engineer in a steam saw mill, and there is a dispute, between myself and the man who is building the furnace, as to the proper place for the wall to strike the boiler (a tubular one); he contends that the wall should strike the boiler above the upper water gage; while I contend that it should strike the boiler a little below the lower water gage, as I think that it is dangerous to have the fire strike the boiler at any point above the water line. Answer: Our correspondent is right. No part of the steam space should be left exposed to the action of the hot gases and flame from the furnace until, at least, they are reduced in temperature, nearly to that of the steam itself and far below the temperature at which iron is perceptibly weaker than when cold.

C. M. S. asks: How can I calculate the effective heating surface of an upright cylindrical boiler, with horizontal water tubes arranged across the fire chamber? Answer: Determine it by measuring the total area of all surfaces exposed to the directly or indirectly communicated heat of the furnace gases, and proceed as directed in replies to earlier correspondents.

B. M. P., who asks for the best thing to remove scale from steam boilers, should read our advertising columns and especially the answers to correspondents. In the latter, directions for treating particular cases are constantly being published.

R. O. B. asks: How can I collect small particles of lead from dross and ashes cheaply? Oil answers very well, but it is too costly. Answer: Fuse the lead with some cyanide of potassium in a crucible.

F. H. asks: Can a valve which has sufficient lap to cut off at one half of the stroke be set so as to admit steam correctly when the crank is upon either center, and shut off the steam when the piston has traveled an equal distance from either end of the stroke? Answer: No. The obliquity of the connecting rod will prevent perfect equality of cut off.

J. F. B. says: Knowing that strange and singular freaks of steam engines are interesting to you, I will tell you of one in our place, that puzzled us for some time. The cylinder is 14 inches bore by 36 inches stroke, with a common slide valve, using steam the whole length of stroke, making 41 revolutions per minute. About two weeks ago, she commenced by making a strange crackling noise in the cylinder, increasing until it seemed as if she would break everything to pieces. Steam poured from every joint that, at other times, was tight, and she slowed down in speed until she scarcely moved. The fly wheel trembled as though about to fall in pieces. But the moment steam was shut off, if only for an instant, she would start up again all right, and the trouble would probably not occur again for one or two hours. At some times it would be more severe than others. Everything seemed to get loose during the difficulty, and all the keys would have to be set up after each occurrence. I took off the cylinder head, found the rings a little slack, and set them out; but the next day, she was as bad as ever. The two boilers are 42 inches in diameter and 26 feet long, having two 13 inch flues in in each. Can you tell me what the difficulty is? Answer: The difficulty arises from excessive priming, we presume and will probably knock out a cylinder head or do worse damage if the trouble is not remedied.

J. P. S. says: How many inches does the lawful bushel used in Pennsylvania in measuring coal contain? Answer: The standard United States bushel is that which contains 2150·4 cubic inches, when level full; when heaped up to standard hight, 6 inches, it contains about 2,700 cubic inches. Usually 28 bushels are reckoned to the tun.

N. L. T. asks: Why is it that the shadows cast by an object from two different lights, as those of the moon and of a candle, on a white surface are of different colors? The difference is most distinct when the object is placed on a line between the two lights. Answer The colors of the lights being different, they together illuminate all of the white surface, not the shadow, with a tint which is compounded of both. The shadows are each illuminated by the light from only one of the two sources, and each therefore differs in tint from the general field, as well as from the other.

C. D. R. & Co., say: We have a 12x20 inch plain slide valve engine, cutting off at about ⅞ stroke and running at 80 revolutions. Would it be economy to speed up to 125 revolutions with the same valve? Answer: If more power is required than the engine can now develope, it would be proper to speed up as proposed. If the boilers are reliable at higher pressure, carry five pounds more steam to make up for friction of pipes and passages at the greater speed. Watch the crank pin and other journals. They may heat at a higher speed.

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T. M. S. says: I would like to know how many pounds pressure it takes to burst the head of a barrel off. The head was of white oak, 1¼ inches thick, and 1 foot 3 inches across. Answer: We have no means of determining the figures desired. We presume it would vary immensely with different kinds of barrels, and with different examples of similar make. Cannot some of our readers enlighten our correspondent?

J. F. W. asks if there is any way of distinguishing anthracite pig iron from charcoal pig iron? Answer: We do not know of any way to distinguish anthracite from charcoal pig iron, nor do we think it can be done by judging from the appearance of the pig metal. Mechanical tests of the product of the metal say that wrought iron will show greater softness for charcoal iron. Swedish bar iron is much softer than Low Moor and other high class irons made with mineral coal.

S. A. T. says: The manner in which a pantagraph is to be constructed is very plain (see page 99 of your current volume), but I do not know whether one (for ordinary use) should be 6 inches or 36 inches in length of longest stick. Can the stationary or pivoted end be fastened to the table with an awl or screw? Can the casters be dispensed with? What is the piece projecting to the left between C and F, from D, for? Why is it jointed differently at F than at E, D and B, and how is it jointed? Answer: Our own instruments are from 18 inches to 30 inches in total length. In a rough apparatus, an awl will answer to pivot the fixed joint. The casters are used to reduce friction, but may be dispensed with. The arrangement of joints is a matter of indifference. In making the copy, say, three quarters the size of the original, the stick B D is hinged near the end which, in the sketch, projects.

G. N. A. says: I wish to know how the red and blue lights such as are seen at the circuses are produced. I want to light a large room without incurring any danger. Answer: It is always better to apply to a pyrotechnist for colored lights, as there is danger in preparing and keeping them, and it would cost less to buy than to attempt to make them.

W. K. asks: Which is the best acid or combination of acids that will entirely destroy the fiber of paper? Answer: The best solvent for paper fiber is cupro-ammonium, known as Schweitzer's reagent.

W. R. J. says: The powder I enclose is the remains of an evaporated gallon of well water. Supposing it to be lime I applied the test for that substance, with no indications. The same kind of water is used in a boiler here and causes some trouble by the deposit. 2. Can a bubble or ball similar to a soap bubble be made of any substance (except glass) that will allow handling? It must be transparent. Could a solution of gelatin be made to serve the purpose by the addition of any material? Answers: The enclosed powder was chiefly composed of carbonate of lime and a little organic matter. The water is evidently impregnated with lime. 2. Soap bubbles of considerable size and strength can be made by mixing glycerin in soap and testing from time to time until the proper proportions are obtained.

J. J. R. asks: Do pure wood ashes contain mineral matter? Answer: It was the opinion of the ancients that the potash of plants was produced from the air during combustion, but as soon as this alkali was discovered in rocks, it was readily traced to plants and shown to be a necessary constituent of all vegetables. It makes no difference how pure wood ashes may be; they necessarily contain mineral matter, chiefly composed of carbonate of potash.

W. H. F. says: 1. I would like to know if there is any way that I can use to get the grime and dirt off of my hands. I am a machinist and I find it very difficult to get my hands clean. 2. I am very desirous of learning to draw, and I would like to know if I can learn without a teacher, and what books you would advise me to get. Answers: 1. Use plenty of soap and elbow grease to clean yourself. 2. With dividers, rule and pencil, practice copying the best engravings in the SCIENTIFIC AMERICAN. You will learn to draw in this way, if you persevere.

S. R. asks: What proportion should there be between the steam port area of a steam engine, and the area of the piston? Also, what should be the relation between the steam pipe and the cylinder? Can poppet valve engines be run at as high a speed as slide valve engines? Answer: Steam ports are made, in good practice, of from one sixteenth to one tenth the area of piston, according to speed. At very high speeds, poppet valves may not seat themselves promptly, and hence a limit of speed is sooner reached than with slide valve engines.

A. B. says: A mercurial siphon gage has one leg twenty times the area of the other; what will be the rise of mercury in the smaller leg per pound pressure? Please give rule. Also a rule to work out the power required to raise a given weight by differential blocks. Answer: The difference of level must be, approximately, two inches per pound. The mercury rising in the smaller leg must be supplied from the larger. This quantity will occupy one twentieth the hight, in the larger leg, that it fills in the smaller. Hence the sum obtained by adding the rise in the smaller leg above the original level to one twentieth the same distance is equal to two inches, and the actual rise in smaller leg will therefore be $\frac{20}{21}$ of two inches $=1\frac{19}{21}$ inches. The exact figure will be $\frac{20}{21} \times 2{\cdot}035 = 1{\cdot}938$. The handiest way to determine the relation of the force exerted to the resistance overcome, in any combination of mechanical powers, is to measure the distances moved by each. For example: If the weight is raised 3 inches, while the fall of the tackle is overhauled a distance of 4 feet, the ratio is as 1 to 16, friction not being considered.

H. P. says: Take a fly wheel ten feet in diameter, with a hollow rim 12 inches depth and 2 feet face (the shell being ½ inch thick), and fill the hollow in the rim half full of water. Will the wheel and water weigh more, or less, when it is in motion and the speed great enough to keep the water next to the face, or when it is standing still? Answer: It will make no difference.

COMMUNICATIONS RECEIVED.

The Editor of the SCIENTIFIC AMERICAN acknowledges, with much pleasure, the receipt of original papers and contributions upon the following subjects:

On the Metal Palladium. By G. J. R.

On the Influence of the Moon on the Tides. By W. S.

On the Formation of the Tides. By S. S. G.

On Steam Engine Economy. By C. H. C.

On the Dredging Machines Used at the Bar of the Mississippi River. By E. B. B.

On Certain Mechanical Enterprises in Newark, N. J. By C. B.

On the Passage of the Sun from one Date to Another. By H. B.

On Lost Arts. By O.

On Perpetual Motion. By W. D. A.

On a Substitute for the Crank and on a Self Operating Water Wheel. By J. B. S.

On Positive and Negative Forces. By E.

On the High Prices of Certain Productions. By J. C. C.

On the Sidereal Day. By J. H.

[OFFICIAL.]

Index of Inventions

FOR WHICH

Letters Patent of the United States

WERE GRANTED FOR THE WEEK ENDING

February 4, 1873,

AND EACH BEARING THAT DATE.

[Those marked (r) are reissued patents.]

Anchor, W. W. Smith	135,450
Auger, earth, Beach & Hanson	135,509
Augers, operating earth, Beach & Hanson	135,510
Bag, traveling, R. Schmitt	135,596
Bale tie, F. Cook	135,526
Bed bottom, C. Penfield	135,580
Bed, cot, L. B. Morse	135,573
Bee hive, Simmons & King	135,493
Bee hive, W. Lehman	135,566
Belt, driving, W. R. Colton	135,409
Belt fastening, T. Rudiger	135,492
Bird cage, O. Lindemann	135,567
Board, straw or mill, J. L. Thomson	135,452
Boats, pitching, W. H. Richardson	135,490
Boiler attachment, wash, M. Martin	135,569
Boiler alarm, Brown & Foskett	135,519
Bolt, E. M. Judd	135,560
Bolt cutter, J. Temlinson	135,497
Bolts, pointing, O. C. Burdict	135,520
Boot and shoe, Rogers & Felton	135,591
Boot lasting machine, C. W. Glidden	135,539
Boot lasting machine, C. W. Glidden	135,540
Boot soles, shaping, C. W. Glidden	135,538
Box, bread, A. R. Ledoux	135,493
Broom head, B. C. Cook	135,525
Brushes, making, A. C. Estabrook	135,415
Buckle, harness tug, F. Seifert	135,601
Cam grooves, dressing, Pratt & King	135,584
Canteen, R. Kelly	135,432
Car coupling, Fox & Howarth	135,537
Car coupling, J. E. Hitt	135,552
Car starter, Lamberton & Lemman	135,564
Car, stock, G. A. Egan	135,532
Car axle lubricator, G. A. Brannan	135,517
Car stake supporter, Mastermann & Hooper	135,486
Car truck, W. Youmans	135,614
Car door lock, W. S. Brewster	135,402
Car seat, railroad, W. C. Huffman	135,557
Cart, excavating, W. Harles	135,546
Cement, hydraulic, A. Pfund	135,582
Cheese hoop, G. B. Boomer	135,514
Cheese skipper extractor, C. Green	135,542
Cigar mold, F. C. Miller	135,572
Cloth steaming machine, H. S. Green	135,543
Clothes pin, W. Wellington	135,501
Clothes wringer, G. S. Prindle	135,585
Coal scuttle, G. Howland	135,554
Cooking utensil, J. Mansfield	135,483
Cotton cleaner, J. Ralston	135,586
Cotton gin, O. Murray	135,495
Cotton laps, making, T. C. Craven	135,528
Cradle and chair, E. Hambujer	135,425
Cultivator, B. C. Bradley	135,401
Cultivator, corn, I. Emrick	135,414
Cupboard, refrigerating, J. Polhamus	135,442
Cupboard and table, B. F. Partridge	135,446
Curtain fixture, S. Ker	135,562
Curtain cord tightener, H. L. Judd	135,561
Dentist's tool, I. W. Lyon	135,435
Depurator, teeth and gum, J. D. Wingate	135,612
Digger, potato, J. W. Innis	135,558
Digger, potato, Wright & Benedict	135,458
Ditching machine, R. Starbrick	135,605
Dowel pins, making, M. Everts	135,416
Drill, ratchet, J. Swank	135,451
Drilling machine, E. J. Worcester	135,613
Earth closet, J. L. Young	135,504
Egg stand and boiler, Woods & Sherwood, (r)	5,269
Egg stand and boiler, Woods & Sherwood, (r)	5,270
Elevating apparatus, Blakley & Cahill	135,511
Elevator, J. H. Blohm	135,398
Elevator, H. S. Stewart, (r)	5,268
Elevator, G. C. Timpe	135,454
Elevator, coal car, P. H. Lamey	135,565
Elevator, lock for, G. C. Timpe	135,453
Emery, grinding, H. S. Lucas	135,482
Engine, reversing, T. L. Crowley	135,410
Engine relief valve, A. Mayer	135,437
Eraser, black board, W. S. Read	135,487
Excavator, J. T. Ham	135,475
Fan, automatic, C. H. Clark	135,524
Faucet, compression basin, W. Gordon	135,541
Faucet, self closing, M. S. Clark	135,407
Feather renovator, S. A. Boyett	135,516
Fire kindler, R. Adams	135,395
Fire kindling, W. B. Tucker	135,607
Fire arms, breech loading, M. J. Chamberlin	135,405
Fire places, lining for, A. J. Redway	135,587
Flour bolt, F. Render	135,583
Flour bolt, G. T. & A. Smith	135,496
Fruit jar, H. Howson	135,430
Furnace, hot air, J. Fridley, Jr	135,422
Furnace, smoke burning, S. A. Ford	135,420
Game apparatus, A. M. Smith	135,494
Gage, harness maker's, D. G. Garlock	135,472
Gas apparatus, H. H. Wainwright	135,455
Gas apparatus, Maring & Mertz	135,568
Gas retort scraper, L. F. Blair	135,397
Gate, J. Blinn	135,468
Glass mold, H. Wickham, Jr	135,502
Glass, etc., marking, H. A. Wassell	135,610
Goods, washing printed, B. G. Brooks	135,518
Governor, M. Gally	135,423
Grain scourer, T. Shiveley	135,602
Grate bar, J. A. Sinclair	135,447
Grinding, etc., machine, A. B. Walters	135,456
Harrow, H. Cartwright	135,464
Harrow, C. Smith	135,448
Harvester, C. Lidren	135,480
Harvester, corn, H. M. Carter	135,408
Harvester cutter, Wasson, Powers & Dungan	135,500
Harvester finger bar, C. A. Smith	135,499
Harvester binder, etc., W. R. Low	135,481
Hat pressing device, C. M. Osgood	135,577
Hat pressing machine, Hastings & Desper	135,428
Hat bodies, felting, Bowden & Shaw	135,399
Heater, feed water, E. Moyel	135,433
Hoe, H. R. Barnes	135,462
Hoisting apparatus, J. N. B. Bond	135,513
Hoops, cutting and bending, J. Dobbins	135,413
Horse power, J. Müller	135,439
Hub, vehicle, H. M. DuBois	135,470
Hub, vehicle, S. McGee	135,570
Ice crusher, Hudner & Little	135,556
Ice machine, Norman & Dietrich	135,576
Ice cream freezer, G. Guinot	135,471
Inhaler, W. H. Cutler	135,411
Iron and steel, Bolton & Pedder	135,512
Ironing apparatus, E. Sumption	135,606
Jack, lifting, J. H. Hinton	135,551
Jack, carriage painter's, A. G. Rykert	135,593
Journal, adjustable, M. Jackson	135,477
Key, folding door, J. Seibert	135,600
Leather, treating, B. C. Young	135,615
Lock, combination, H. Clark	135,523
Loom shuttle, Sawyer & Wright	135,446
Loom, Hastings, Nichols & Merritt	135,427
Looms, shaping dents of, M. Robinson	135,444
Mattress, F. A. Lane (r)	5,266
Metallic fabric, A. J. Vandegrift	135,608
Moccasin, T. Horsey	135,548
Mop, etc., J. L. Boyden	135,400
Mortising machine, J. H. Stahl	135,604
Mower, lawn, S. D. King	135,563
Needle setter, etc., A. Johnston	135,479
Nut lock, Hood & Coombs	135,553
Organ reed, J. R. Perry	135,581
Ovals, turning, M. T. Boult	135,515
Packing case, E. A. Pharo	135,583
Paper box, M. W. Dillingham	135,469
Paper feeding machine, Schofield & Baker	135,597
Paper feeding machine, Schofield & Baker	135,598
Paper feeding machine, Schofield & Baker	135,599
Pavement, wood, M. H. Alexander	135,460
Peg rasp, J. W. Foard	135,419
Pencil holder, G. A. Smith	135,603
Petroleum, burning, F. A. Hall	135,476
Pickets, pointing, A. B. Corby	135,467
Piston rod stuffing box, P. W. Richards	135,589
Planter, corn, A. C. & G. F. Burgner	135,521
Planter, hand corn, L. H. Richards	135,489
Platform, track, W. P. Halliday	135,545
Plow, wheel, M. Saltley	135,594
Pot, coffee, Grigsby & Braselton	135,544
Pot, mustard, T. M. Schleier	135,595
Power, transmitting, J. C. Cline	135,466
Press, compressing, G. Ertel	135,533
Press, cotton, R. Powers	135,486
Propeller, steering, J. L. Cathcart	135,401
Propeller, vessel, E. C. Hubbard	135,555
Pump, steam, J. W. Handren	135,426
Purifier, middlings, C. E. McNeal	135,571
Railway snow plow, W. Walker	135,499
Railway switch, A. W. Cram	135,527
Railway tank feeder, A. Grochau	135,473
Rod, lightning, W. B. Munn	135,574
Ruches, setting, etc., M. & S. Roggenburger	135,445
Sad iron crimper, J. Hewitt	135,550
Sash fastener, J. Bishop	135,396
Saw frame, buck, W. Clemson	135,408
Saw mill holder, Barsaloux & Prescott	135,508
Sawing machine, W. Neidecffer	135,575
Sewing machine, D. S. Alling	135,461
Sewing machine, J. L. Follett	135,536
Sewing machine, F. Chichester	135,465
Sewing machine feeder, C. Parham	135,579
Sewing machine wax thread, W. H. Johnson	135,431
Shaft bearing, G. M. Ball	135,506
Shawl strap, T. R. Dunham	135,530
Shingle machine, H. Peavey	135,441
Shirt, O. Gowing	135,424
Shirt bosom, C. W. Jenks	135,478
Show case, Arnold & Merz	135,505
Silk, twisting, H. A. Chapin	135,522
Spool stand, etc., L. F. Ward	135,609
Spool machine, J. F. C. Rider	135,443
Spoon, fork, etc., G. C. Robinson	135,590
Stirrup, riding, A. J. Herring	135,547
Stone grinding machine, J. Finn	135,535
Stove damper, J. Willoughby	135,611
Stove grate, S. Duncan	135,471
Stove, heating, S. Smith	135,449
Stove top plate, E. H. Wehrle	135,457
Sugar apparatus, S. Dod	135,529
Table slide, G. Finkbeiner	135,418
Telegraph pole, C. F. Howes	135,429
Telegraph printing, G. Little (r)	5,267
Telegraph circuit, T. A. Edison	135,531
Ticket punch, H. W. Hewet	135,549
Tin scraps, etc., treating, H. Panton	135,578
Tire bender, J. Tomlinson	135,498
Tobacco curing, J. D. Culp	135,468
Tobacco box, etc., C. Remhof	135,488
Torch, etc., P. Ryan	135,592
Toy block, H. Fairbanks	135,417
Trap, animal, S. F. Estel	135,534
Tube cutter, E. Manuel	135,484
Tube speaking, C. A. Fredericks	135,421
Vehicle wheel, H. B. Leckenby	135,434
Ventilator, G. R. Barker	135,507
Wagon brake, R. Roberts	135,491
Watch, winding and setting, C. E. Jacot	135,559
Water wheel, turbine, A. Wrealsh	135,503
Water wheel, turbine, P. W. Yarrell	135,459
Water wheel bucket, S. L. Denney	135,412
Wrench heads, making, L. Chapman	135,406
Wringing machine, H. Glass (r)	5,265

APPLICATIONS FOR EXTENSIONS.

Applications have been duly filed, and are now pending for the extension of the following Letters Patent. Hearings upon the respective applications are appointed for the days hereinafter mentioned:

22,528.—WEBBING.—J. C. Cooke. April 9, 1873.
23,886.—CULTIVATOR.—M. Alden. April 23, 1873.
23,893.—GATE FASTENING.—E. Behr. April 23, 1873.
23,921.—HARVESTING MACHINE.—M. G. Hubbard. April 23.
23,924.—MAIL BAG.—T. J. Lamdin. April 23, 1873.
23,950.—CLOCK DIAL.—S. E. Root. April 23, 1873.
23,950.—LATHE.—C. & A. Spring. April 23, 1873.
23,983.—COOK STOVE.—H. G. Leonard. April 23, 1873.
21,654.—PIN STICKING.—J. W. Naramore. June 18, 1873.

EXTENSIONS GRANTED.

23,001.—ELASTIC TOY.—L. P. Porter.
22,990.—MOP HEAD.—L. Taylor.
22,947.—WRENCH.—D. P. Foster.

DESIGNS PATENTED.

6,378.—CARD RECEIVER.—G. Gill, Taunton, Mass.
6,379 & 6,380.—CAKE BASKETS.—G. Gill, Taunton, Mass.
6,381.—CENTER PIECE.—S. Kellett, San Francisco, Cal
6,382.—URN.—P. P. Meyer, New York city.
6,383.—BEER MUG.—J. Oesterling, Wheeling, W. Va.
6,384.—VASE.—W. H. Wilkinson, New York city.

TRADE MARKS REGISTERED.

1,115.—HAMS, ETC.—Evans Brothers, Cincinnati, Ohio.
1,116.—BEARING METAL.—I X L Metal Co., St. Louis, Mo.
1,117 & 1,118.—GALVANIZED IRON.—McCullough Iron Co. Philadelphia, Pa.
1,119.—BOOTS, ETC.—C. Merritt, South Weymouth, Mass
1,120 to 1,122.—GINS.—F. E. Suire & Co., Cincinnati, Ohio

SCHEDULE OF PATENT FEES:

On each Caveat	$10
On each Trade-Mark	$25
On filing each application for a Patent (17 years)	$15
On issuing each original Patent	$20
On appeal to Examiners-in-Chief	$10
On appeal to Commissioner of Patents	$20
On application for Reissue	$30
On application for Extension of Patent	$50
On granting the Extension	$50
On filing a Disclaimer	$10
On an application for Design (3½ years)	$10
On an application for Design (7 years)	$15
On an application for Design (14 years)	$30

CANADIAN PATENTS.

OFFICIAL LIST OF PATENTS GRANTED IN CANADA FROM DECEMBER 13, 1872, UP TO AND INCLUDING FEBRUARY 1, 1873.

Patents taken by citizens of the United States are marked U. S.

[NOTE.—Under the new patent law, now in vogue, American citizens may patent their inventions in Canada on favorable terms. For full particulars, address Munn & Co., Office SCIENTIFIC AMERICAN, 37 Park Row, N. Y.]

Shoe pegging machine, H. Kuhlman, Ger., Dec. 13	1,900
Steam engine, C. Levey, U. S., Dec. 19	1,901
Wood for paper, L. Smith, Dec. 18	1,902
Hose valve, E. A. Day, U. S., Dec. 18	1,903
Nail machine, N. W. Goderich, U. S., Dec. 18	1,904
Needle machine, F. W. Mallett, U. S., Dec. 18	1,905
Stool, A. A. Murphy, Dec. 18	1,906
Hot air drum, G. Bolton, Dec. 18	1,907
Washing machine, G. R. Willett, N. S. Dec. 18	1,908
Wood pulp, R. Harrison, U. S., Dec. 18	1,909
Slip keel, etc., J. Dean, U. S., Dec. 18	1,910
Track cleaner, A. Day, U. S., Dec. 18	1,911
Washing machine, G. Moorehouse, Dec. 18	1,912
Water meter, D. B. Spooner, U. S., Dec. 18	1,913
Washing machine, G. Schatz *et al.*, U. S., Dec. 18	1,914
Propelling sleighs, W. Nevers, U. S., Dec. 23	1,915
Bench, R. Blain, Dec. 23	1,916
Square, J. Beaudry, Dec. 23	1,917
Boot, etc., G. Goodyear, U. S., Dec. 23	1,918
Steam packing, G. Gwynn, U. S., Dec. 23	1,919
Cigar machine, J. W. Innis, U. S., Dec. 23	1,912
Cutting soles, S. J. Shaw, U. S., Dec. 23	1,922
Shuttle spool, T. H. Dodge, U. S., Dec. 23	1,923
Boot sole, S. Slater, Dec. 30	1,924
Trimming trees, T. Madgett, J. Hudson, Dec. 30	1,925
Burnisher, L. Cote, Dec. 30	1,926
Churn, M. Fisks, U. S., Dec. 30	1,927
Coffin, S. Stein, U. S., Dec. 30	1,928
Fitting gores, J. Walden, U. S., Dec. 30	1,929
Biscuit machine, J. Turner & S. Turner, Dec. 30	1,930
Desk, J. K. Otis, U. S., Dec. 30	1,931
Kettle, F. P. L. Jones, N. S., Dec. 30	1,932
Damper, A. Abell, Dec. 30	1,933
Sash fastener, J. McCallum, Dec. 30	1,934
Sewing machine, etc., G. Young, Dec. 30	1,935
Riveting soles, H. H. Bigelow, U. S., Dec. 30	1,936
Wheel, S. Vreeland, U. S., Dec. 30	1,937
Spool, etc., J. F. C. Rider, U. S., Dec. 20	1,938
Furnace, W. J. Keep, U. S., Dec. 30	1,939
Cook stove, etc., W. J. Keep, U. S., Dec. 30	1,940
Cleaning grain, A. Hunter, E. H. Osborne, U. S., Jan. 3	1,941
Baling press, W. R. King, U. S. Jan. 3	1,942
Preserving meat, J. K. Collett, Eng., Jan. 3	1,943
Paper bags, L. D. Benner, U. S., Jan. 3	1,944
Turning, J. Fensom, Jan. 3	1,945
Nail machine, D. Turbayne, G. M. Wyman, U. S., Jan. 3	1,946
Wringer, S. Blodgett, U. S., Jan. 3	1,947
Paper fastener, W. R. Clough, U. S., Jan. 3	1,948
Fence, B. Gouldthorpe, Jan. 3	1,949
Treadle, R. Field, U. S., Jan. 3	1,950
Slide valve, H. Fairgrieve, Jan. 9	1,951
Bob sleigh, J. Malone, Jan. 9	1,952
Covering boilers, T. Sparham, Jan. 9	1,953
Boot stretcher, J. Lyons, Jan. 9	1,954
Heater and filter, J. Armstrong, U. S., Jan. 9	1,955
Removing hay, J. C. Cramer, Jan. 9	1,956
Water lifter, E. J. Jarvis, Jan. 9	1,957
Braider, etc., P. L. Sheepler, F. M. Heath, U. S., Jan. 9	1,958
Shuttle, J. H. Osborne, Jan. 9	1,959
Soap, J. Burke, U. S., Jan. 8	1,960
Slide valve, H. Fairgrieve, Jan. 10	1,961
Steam engine, L. Perkins, Eng., Jan. 10	1,962
Pipe elbow, C. Bolton, Jan. 10	1,963
Car coupler, etc., W. P. Scott, Jan. 10	1,964
Pump, P. Munsinger, Jan. 10	1,965
Car coupling, H. Ellender, Jan. 10	1,966
Horse collar, C. P. Holmes, U. S. Jan. 10	1,967
Stand, R. M. Wanzer, Jan. 20	1,968
Stove, J. Van B. Carter, J. Dwyer, U. S., Jan. 10	1,969
Buckle, H. S. Woodruff, Jan. 10	1,970
Lubricator, E. McCoy, U. S., Jan. 10	1,971
Iron and steel, C. M. Nes, U. S., Jan. 14	1,972
Line fastener, O. Benoit, Jan. 14	1,973
Bit brace, W. A. Ives, U. S., Jan. 16	1,974
Saw, M. Jincks, U. S., Jan. 14	1,975
Balance valve, H. Fairgrieve, Jan. 14	1,976
Marine engine, L. Perkins, Eng., Jan. 14	1,977
Washing machine, G. S. Walker *et al.*, U. S., Jan. 15	1,978
Washing machine, S. Deveau, S. E. Perkins, Jan. 14	1,979
Tubing, K. M. Arnoldi, Jan. 14	1,980
Steam heat, W. C. Baker, U. S., Jan. 14	1,981
Furnace, etc., O. W. Ketchum, Jan. 14	1,982
Furnace, etc., O. W. Ketchum, Jan. 14	1,983
Furnace, O. W. Ketchum, Jan. 14	1,984
Iron and steel, J. Webster, Eng., Jan. 14	1,985
Tar burner, J. Burns, Jan. 16	1,986
Shingle machine, G. I. Anderson *et al.*, U. S., Jan. 16	1,987
Lubricator, J. S. Eggleston, U. S., Jan. 16	1,988
Stove drum, R. Lough, Jan. 16	1,989
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VALUE OF PATENTS.

And How to Obtain Them.

Practical Hints to Inventors

PROBABLY no investment of a small sum of money brings a greater return than the expense incurred in obtaining a patent even when the invention is but a small one. Large inventions are found to pay correspondingly well. The names of Blanchard, Morse, Bigelow, Colt, Ericsson, Howe, McCormick, Hoe and others, who have amassed immense fortunes from their inventions, are well known. And there are thousands of others who have realized large sums from their patents.

More than FIFTY THOUSAND inventors have availed themselves of the services of MUNN & Co. during the TWENTY-SIX years they have acted as solicitors and Publishers of the SCIENTIFIC AMERICAN. They stand at the head in this class of business; and their large corps of assistants, mostly selected from the ranks of the Patent Office: men capable of rendering the best service to the inventor, from the experience practically obtained while examiners in the Patent Office: enables MUNN & Co. to do everything appertaining to patents BETTER and CHEAPER than any other reliable agency.

HOW TO OBTAIN *Patents*.

This is the closing inquiry in nearly every letter, describing some invention which comes to this office. A *positive* answer can only be had by presenting a complete application for a patent to the Commissioner of Patents. An application consists of a Model, Drawings, Petition, Oath, and full Specification. Various official rules and formalities must also be observed. The efforts of the inventor to do all this business himself are generally without success. After great perplexity and delay, he is usually glad to seek the aid of persons experienced in patent business, and have all the work done over again. The best plan is to solicit proper advice at the beginning. If the parties consulted are honorable men, the inventor may safely confide his ideas to them; they will advise whether the improvement is probably patentable, and will give him all the directions needful to protect his rights.

How Can I Best Secure My Invention?

This is an inquiry which one inventor naturally asks another, who has had some experience in obtaining patents. His answer generally is as follows, and correct:

Construct a neat model, not over a foot in any dimension—smaller if possible—and send by express, prepaid, addressed to MUNN & Co., 37 Park Row, together with a description of its operation and merits. On receipt thereof, they will examine the invention carefully, and advise you as to its patentability, free of charge. Or, if you have not time, or the means at hand, to construct a model, make as good a pen and ink sketch of the improvement as possible and send by mail. An answer as to the prospect of a patent will be received, usually, by return of mail. It is sometimes best to have a search made at the Patent Office; such a measure often saves the cost of an application for a patent.

Preliminary Examination.

In order to have such search, make out a written description of the invention, in your own words, and a pencil, or pen and ink, sketch. Send these, with the fee of $5, by mail, addressed to MUNN & Co., 37 Park Row, and in due time you will receive an acknowledgment thereof, followed by a written report in regard to the patentability of your improvement. This special search is made with great care, among the models and patents at Washington, to ascertain whether the improvement presented is patentable.

To Make an Application for a Patent.

The applicant for a patent should furnish a model of his invention if susceptible of one, although sometimes it may be dispensed with; or, if the invention be a chemical production, he must furnish samples of the ingredients of which his composition consists. These should besecurely packed, the inventor's name marked on them, and sent by express, prepaid. Small models, from a distance, can often be sent cheaper by mail. The safest way to remit money is by a draft, or postal order, on New York, payable to the order of MUNN & Co. Persons who live in remote parts of the country can usually purchase drafts from their merchants on their New York correspondents.

Caveats.

Persons desiring to file a caveat can have the papers prepared in the shortest time, by sending a sketch and description of the invention. The Government fee for a caveat is $10. A pamphlet of advice regarding applications for patents and caveats is furnished gratis, on application by mail. Address MUNN & Co., 37 Park Row New York.

Reissues.

A reissue is granted to the original patentee, his heirs, or the assignees of the entire interest, when, by reason of an insufficient or defective specification, the original patent is invalid, provided the error has arisen from inadvertence, accident, or mistake, without any fraudulent or deceptive intention.

A patentee may, at his option, have in his reissue a separate patent for each distinct part of the invention comprehended in his original application by paying the required fee in each case, and complying with the other requirements of the law, as in original applications. Address MUNN & Co., 37 Park Row, New York, for full particulars.

Design Patents.

Foreign designers and manufacturers, who send goods to this country, may secure patents here upon their new patterns, and thus prevent others from fabricating or selling the same goods in this market.

A patent for a design may be granted to any person, whether citizen or alien, for any new and original design for a manufacture, bust, statue, alto relievo, or bas relief; any new and original design for the printing of woolen, silk, cotton, or other fabrics, any new and original impression, ornament, pattern, print, or picture, to be printed, painted, cast, or otherwise placed on or worked into any article of manufacture.

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Canadian Patents.

On the first of September, 1872, the new patent law of Canada went into force, and patents are now granted to citizens of the United States on the same favorable terms as to citizens of the Dominion.

In order to apply for a patent in Canada, the applicant must furnish a model, specification and duplicate drawings, substantially the same as in applying for an American patent.

The patent may be taken out either for five years (government fee $20), or for ten years (government fee $40) or for fifteen years (government fee $60). The five and ten year patents may be extended to the term of fifteen years. The formalities for extension are simple and not expensive.

American inventions, even if already patented in this country, can be patented in Canada provided the American patent is not more than one year old.

All persons who desire to take out patents in Canada are requested to communicate with MUNN & Co., 37 Park Row, New York, who will give prompt attention to the business and furnish full instruction.

Foreign Patents.

The population of Great Britain is 31,000,000; of France, 37,000,000; Belgium, 5,000,000; Austria, 36,000,000; Prussia, 40,000,000, and Russia, 70,00,000. Patents may be secured by American citizens in all of these countries. Now is the time, when business is dull at home, to take advantage of these immense foreign fields. Mechanical improvements of all kinds are always in demand in Europe. There will never be a better time than the present to take patents abroad. We have reliable business connections with the principal capitals of Europe. A large share of all the patents secured in foreign countries by Americans are obtained through our Agency. Address MUNN & Co., 37 Park Row, New York. Circulars with full information on foreign patents, furnished free.

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Rejected cases, or defective papers, remodeled for parties who have made applications for themselves, or through other agents. Terms moderate. Address MUNN & Co., stating particulars.

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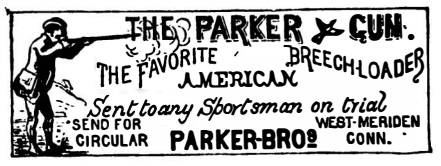

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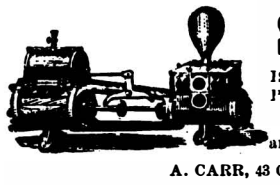

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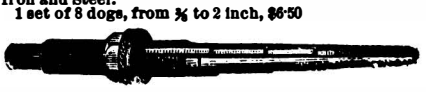

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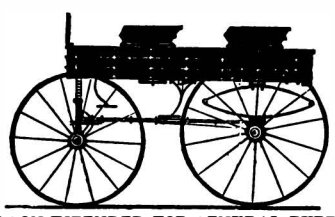

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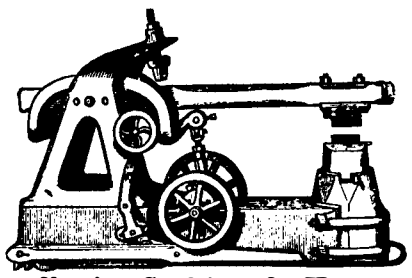

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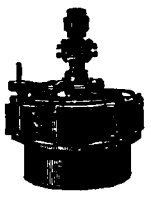

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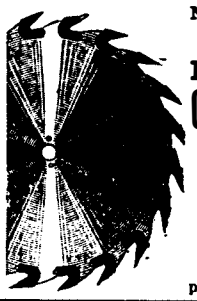

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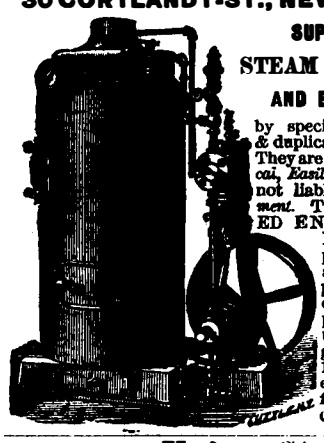

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